DRAFT FINAL

PROPOSED SURFACE WATER INTERIM MEASURES/INTERIM REMEDIAL ACTION PLAN AND DECISION DOCUMENT FOR THE 903 PAD, MOUND AND EAST TRENCHES AREAS (OPERABLE UNIT NO. 2)

PUBLIC COMMENT

RESPONSIVENESS SUMMARY

U.S. Department of Energy
Rocky Flats Plant
Golden, Colorado

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EXECUTIVE SUMMARY

The Department of Energy (DOE) is pursuing an Interim Measure/Interim Remedial Action (IM/IRA) at the 903 Pad, Mound, and East Trenches Areas (Operable Unit No. 2) at the Rocky Flats Plant (RFP). This IM/IRA is to be conducted to minimize the release from these areas of hazardous substances that pose a potential threat to the public health and environment. The Plan involves the collection of contaminated surface water, treatment by chemical precipitation, cross-flow membrane filtration and granular activated carbon (GAC) adsorption, and surface discharge of treated water. Complete information is presented in the document entitled "Proposed Interim Measures/Interim Remedial Action Plan and Decision Document, 903 Pad, Mound, and East Trenches Areas, Operable Unit No. 2" (IM/IRAP) dated 26 September 1990. Information concerning the proposed Surface Water IM/IRA was presented during a public meeting held from 7 to 10 p.m., Tuesday, 23 October 1990, at the Westminster City Park Recreation Center in Westminster, Colorado.

This Responsiveness Summary presents DOE's response to all comments received at the public meeting, as well as those mailed to DOE during the public comment period which ended 24 November 1990. There were a number of technical comments on the plan that DOE has addressed herein. It is noted that several major issues were raised by the comments. Of particular note is the objection to the interbasin transfer of contaminated Woman Creek surface water to the South Walnut Creek drainage. In the IM/IRA Plan, it is proposed to collect seeps southeast of the 903 Pad in the Woman Creek drainage. The seepage would subsequently be transported by pipeline or tanker truck to a centrally located treatment facility discharging to the South Walnut Creek drainage.

The Woman Creek seeps are in an area of surface soil plutonium contamination. However, the risk assessment presented in Section 7.6.3 indicates radiation exposure to workers and the public from construction of seep collection sumps and truck transport of collected water is 200 times lower than acceptable airborne exposure limits to any member of the general public. These risk estimates are conservative, since they are based on the absence of any dust suppression techniques. Dust suppression will be implemented, as described in Section 7.1.

Regardless of the estimated low risk to the public from construction and water transport activities, the popular sentiment of the public, based on comments received, is strong concern over worker and public health risks from these activities. The City of Broomfield is strongly opposed to transfer of plutonium contaminated water from the Woman Creek drainage to the South Walnut Creek drainage based on their stated uncertainty as to the IM/IRA treatment facility performance with respect to radionuclide removal. In addition, the City of Westminster finds construction activities in the Woman Creek drainage to be unacceptable until the Option B interceptor canal is constructed.

In light of these public and municipal concerns, DOE proposes to modify the IM/IRA Plan of 26 September 1990 so that Woman Creek seepage will not be transferred to the South Walnut Creek drainage. DOE proposes to postpone the collection of Woman Creek seeps until the bench scale treatability tests have been completed. These tests have been delayed because the seeps have been dry and no sample has been available for testing. It is expected that seep water will be available in March 1991. By allowing adequate time for testing, data interpretation and preparation of reports, an addendum to the IM/IRA Plan can be completed during the summer of 1991. The treatment and discharge options to be evaluated and proposed in this addendum would not include the transfer of either treated or untreated water from the Woman Creek drainage.

The IM/IRA treatment facility at South Walnut Creek is expected to achieve chemical-specific Applicable or Relevant and Appropriate Requirements (ARARs). Even in the event that the results of the treatability studies indicate that it is not practical to fully attain some of the ARARs, a reduction in the contaminants present will still be realized by treatment. Treatment will also assist current actions to achieve State Segment 4 Walnut Creek standards before discharge.

Additional interceptor canal projects as commented upon by Westminster are the subject of separate negotiations between Department of Energy and the cities; these negotiations are not being reported on in this document. Whether or not the canal is in place at the start of construction of this IRA, DOE is fully committed to execution of the project in a safe and reliable manner. The OU 2 IM/IRA, is being carefully planned in conjunction with the EPA and CDH to ensure an effective and safe action and to ensure that all necessary environmental monitoring will accompany remediation.

There are several issues where multiple comments were received by the public. These issues include the following:

- Generation of plutonium contaminated dust, and worker and public health and safety
- ARARs (selection and attainment)
- Treatability studies
- Monitoring
- IM/IRA system operation/performance
- Zero discharge concept
- Community relations (and document availability)
- Tank truck transport of surface water

Responses to these and other issues are included in the document.

SECTION 1

COMMUNITY INVOLVEMENT

The Rocky Flats Plant is developing a Community Relations Plan to involve the public in the decision-making process as it relates to the environmental restoration activities. The plan will meet the community relations requirements of the Resource Conservation and Recovery Act (RCRA), the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) and the DOE/EPA/CDH draft Inter-Agency Agreement (IAG) for Environmental Restoration (ER) Program activities. Activities under the plan are also intended to meet requirements of the National Environmental Policy Act (NEPA).

While RCRA, CERCLA and the IAG provide the basis for the Community Relations Plan, the plan is tailored to the concerns and needs of the community expressed during a series of interviews with nearly 100 local citizens. The interview participants also suggested community relations activities that would help the public become better informed about environmental cleanup at the plant and ensure early citizen involvement in the decision making process.

In the meantime, the plant continues efforts already in place to inform the public and to solicit input regarding environmental restoration activities. For the Proposed Surface Water Interim Measures/Interim Remedial Action Plan for the 903 Pad, Mound, and East Trenches Areas specifically, presentations were made to the surrounding municipalities and to the Rocky Flats Environmental Monitoring Council. A presentation on the proposed plan was also provided at the public comment meeting on 23 October 1990 at the Westminster City Park Recreation Center, Westminster, Colorado.

Citizens were notified of the availability of the document, the 60-day public comment period and the public comment meeting through newspaper, radio and direct mail announcements. A fact sheet describing the remediation area and the proposed plan was also mailed to approximately 1,500 individuals and organizations on the Rocky Flats mailing list.

Other ongoing public information efforts include the periodic Rocky Flats Environmental Restoration Update, an active speakers bureau for civic and educational organizations and tour programs for groups and individual citizens. The Community Relations Division also responds to numerous inquiries and requests for information about plant activities.

Four public reading rooms, which provide public access to environmental restoration documents, are maintained by the DOE, the EPA, the CDH and the Rocky Flats Environmental Monitoring Council. The DOE Public Reading Room is located in the Front Range Community College Library in Westminster, Colorado.

SECTION 2

RESPONSES TO COMMENTS RECEIVED DURING PUBLIC COMMENT PERIOD

On October 23, 1990, DOE held a public meeting to receive comments on the Surface Water IM/IRA Plan for the 903 Pad, Mound and East Trenches Areas (Operable Unit No. 2). These comments are presented here in the order they were received at the public meeting. Written comments were also provided by several members of the public, EPA, CDH, the cities of Arvada, Westminster, and Broomfield, and the Rocky Flats Cleanup Commission. These comments were not verbally presented at the public meeting. The comments have been subdivided at points where the issue or subject changes, and the DOE response directly follows. All comments have been numbered sequentially to allow cross-referencing of responses. In addition, the following table has been prepared to provide an index of the comments by issue.

ISSUE	COMMENTS REFERRING TO ISSUE
Generation of plutonium contaminated dust, and worker and public health and safety	4, 8, 13, 15, 23, 24, 30, 35, 40, 56, 57, 58, 61 107, 111, 113, 115, 117, 121, 123, 129, 130, 144, 152, 167
Interbasin water transfer	118, 133, 135
ARARs (selection and attainment)	16, 22, 28, 43, 44, 62, 65, 66, 67, 69, 70, 71, 72, 73, 74, 80, 81, 98, 99, 116, 120, 136, 145, 161
Treatability studies	25, 125, 136, 153, 160
Monitoring	17, 25, 32, 34, 123, 128, 134, 156
IM/IRA system operation/performance	6, 9, 17, 25, 29, 32, 61, 63, 77, 79, 90, 93, 94
Zero discharge concept	33, 38, 51, 60, 122, 123, 124, 129, 135
Community relations (and document availability)	14, 21, 27, 30, 35, 45, 53, 55, 58, 59, 136, 159, 166
Tank truck transport of surface water	19, 23, 40, 124, 132, 151

2.1 VERBAL COMMENTS RECEIVED DURING PUBLIC MEETING

COMMENTOR: **Kathleen Sullivan**
Rocky Mountain Peace Center

Comment 1

Before I go ahead with my brief comments, I would just like to say that all of us being concerned about waste that I'm very surprised to find this packet which, in itself, represents a lot of waste. If nothing else, you could have cut down your usage of paper by printing the material on the front and the back. So, in this case, you could have cut your use of paper by 50%. Also, if the wording on these pages were consolidated in a better way, then you could have probably cut down paper usage by another quarter. So, I think being concerned about waste as we are that these issues are very important to look at and I hope that that's addressed.

Response to Comment 1

Printing text on both sides of the pages of the Surface Water IM/IRA Plan, or other such plans, reduces paper usage, but unfortunately can result in production difficulties in preparing the original volumes as well as subsequent copies of the Plan. However, the DOE has an effective paper recycling program in which copies of draft documents are recycled. Also, the space-and-a-half spacing is used in these documents for ease in reading.

Comment 2

I find myself a bit frustrated and angry about constantly being posed with this idea of nothing posing "immediate problems." And, I think that this kind of attitude is involved in what actually created the disastrous situation that we have at the 903 Pad and the other facilities that we're talking about this evening. Immediate, maybe not tomorrow, but you can bet for the next 100,000 years we're going to be having problems with the plutonium that is a result of contamination from the plant.

I think this represents a profound lack of respect for plutonium and other radionuclides that brought about the 903 disaster in the first place. And, the fact that the DOE and the Colorado Health Department have so-called permissible levels of plutonium emissions when the plant is in regular production is an immediate problem. We do not have the respect that is needed for this deadly mutagenic stuff which in the case of plutonium, need I remind you, will be around for 240,000 years.

Furthermore, I think it's also dangerous to talk about immediate threats constantly involving human beings when this contamination has already occurred in relation to the air, the water, the soil, and countless other living beings that inhabit this area. I think that that's important to take into consideration.

So my brief comment to the DOE, EPA, CDH, and EG&G is that we need more respect for the substance and that inherent in this respect of radionuclides and plutonium is a respect for all life.

Response to Comment 2

Use of the phrase "not immediate" to describe the OU 2 contaminated surface water situation appears to convey the misconception that the DOE does not give the Surface Water IM/IRA Project, or radionuclide contamination in the environment, due concern. Use of this phrase was merely intended to reflect that contaminated runoff does not leave the plant site because it is effectively contained by retention Ponds B5 and C2, treated, and monitored prior to discharge.

COMMENTOR: **Paula Elofson-Gardine**
Director, Concerned Health Technicians for a Cleaner Colorado
Director, Rocky Flats Cleanup Commission

Comment 3

I would also like to ask that we not be heckled from the employee peanut gallery over here while we give our testimony. I think it's inappropriate to have the speakers as we go hassled as they're speaking, such as the last one.

I would like to mention that in terms of Kathleen's testimony, this is also a deep concern for many of us that the spread of contaminants from everyday operations are not regarded as immediate hazard, however, the latency periods are a concern for the citizens because of difficulty of proving cause and effect.

Response to Comment 3

The potential for environmental contamination resulting from RFP operations is of the utmost importance to the DOE and is the basis for the personnel and environmental monitoring programs at the facility.

Comment 4

We have some concerns in regards to encroachment of the radioactive seeps in regards to the 881 cleanup area and we are very concerned that the employees working on that remediation have the appropriate protection.

Response to Comment 4

The seeps identified at OU 2 for collection are not in the area of remediation at OU 1. Employees involved with implementation of the IM/IRA at OU 1 are following the Site-Specific Health and Safety Plan (SSHSP) for that activity and thus are provided adequate protection from all potential hazards.

Comment 5

The executive summary of this implies that the water meets NPDES requirements and that they are not a threat to the public. However, the NPDES permit requirements do not include radionuclides currently and the new NPDES permit is not out yet. So, the implication that the water is okay because it meets NPDES permits is somewhat of a misnomer because it does not include the radioactive constituents.

Response to Comment 5

Although the existing NPDES permit does not address radionuclide (or organic) constituents, the water contained in ponds B5 and C2 is being treated for removal of organic contaminants using granular activated carbon (GAC). Prior to GAC treatment, the water is filtered to remove suspended particulates to which radionuclides may be adsorbed. In addition, the treated water is monitored for radionuclides prior to discharge in order to determine compliance with the stringent in-stream standards for Segment 4 of Woman and Walnut Creeks. The text in the Executive Summary of the IM/IRA has been modified to eliminate the potential for misunderstanding.

Comment 6

I also have a question that I would like to have addressed in the Responsiveness Survey that have any field and lab studies been done to confirm the isotopic identity of the seeps, the dissolved fractions, particle sizes, and/or solubility or nature of insolubles in the area of seeps? And, the leachate from the high soil contamination has not been addressed in this study.

Also, there is some concern that the radioactive removal unit assumes an ionic radioactive species. There are other studies that have been done. For example, I will cite RFP Report 2901, Soil Decontamination at Rocky Flats; RFP Report 3914, Dust Transport-Wind Blown and Mechanical Resuspension; RFP Report 3130, Decontamination of Soil Containing Plutonium and Americium; RFP Report 3226, Removal of Plutonium Contaminated Soil from 903 Lip Area During 1976 and 1978

It indicates that greater than 50% of the contamination in this area is suspected to be in the less than .01 micron size range in an insoluble variety and that there is some deep concern that the current plan for removal of the radionuclides from seeps does not take this particle sized fraction into consideration. There's tremendous concern that there be appropriate studies that will include that greater than 50% fraction of contamination to be addressed.

Response to Comment 6

The organic and inorganic constituents for which the OU 2 surface water seeps have been analyzed are listed in Volume II of the Surface Water IM/IRA Plan (see Appendix C for quick reference). The radioactive isotopes include the following:

- Strontium 89 and 90
- Plutonium 240 and 241
- Americium 241
- Uranium 233 + 234, 235, and 238
- Tritium

All radionuclide analyses have been conducted in accordance with QA/QC plans. The analyses determine soluble and insoluble fractions as described in Response to Comment 9 (i.e. "total" vs. "dissolved" concentrations). In addition to the standard "total" and "dissolved" analyses, the DOE is currently conducting a study to further understand the distribution of soluble and particulate plutonium and americium contamination in surface water seeps. In this study, raw surface water samples are analyzed along with 0.45, 0.2, and 0.1 μm filtrates of the sample. This successive pore size investigation will result in a better understanding of the size distribution of contamination in the surface water seeps. Continued characterization of OU 2 surface water will be conducted in the Phase II Remedial Investigation/Feasibility Study (RI/FS) during 1991 and 1992.

Leachate from contaminated soil is addressed indirectly by collection and analysis of runoff at the surface water monitoring stations. For example, SW-55 seepage comes in contact with contaminated soil prior to its arrival at SW-55. Specific soil leachate tests, however, have not been conducted on OU 2 soil samples.

Selection of the cross-flow membrane filtration process is not based on an assumption of the presence of particular ionic radionuclide species. The optimum chemical pretreatment will be formulated in the treatability studies for radionuclide removal.

Removal of radionuclides adhering to particulates smaller than the pores in the cross-flow filter media is also addressed in Response to Comment 9.

Comment 7

There is a concern over the lack of hydrogeology information and plume dispersion that would hamper appropriate interception attempts. For example, the sandstone lenses have been notated in the past reports to be of questionable integrity and some technicians have questioned the migration between the alluvium because of this.

Response to Comment 7

The hydrogeology of the Rocky Flats Plant is complex. A major goal of the Phase II (alluvium and bedrock) remedial investigation scheduled to commence in February 1991 is to collect sufficient data to characterize the hydrogeology, and contaminant movement in the water bearing units. Ground water withdrawal techniques for control of seep flow have not been proposed at this time because this is an interim measure directed at surface water. Furthermore, the DOE has previously proposed a groundwater interim measure that has been deferred due to insufficient geohydrological information at OU2. Due to comments received on the Surface Water IM/IRA Plan we are deferring collection and treatment of Woman Creek seeps until such time as we can reevaluate alternatives. Please see our discussion in the Executive Summary.

Comment 8

Plutonium transport by wind is noted as significant and a primary source of contamination spread, but the resuspension hazard has not been addressed for safety measures for workers and with respect to remediation activities since you will have earth moving involved out there at the site regardless of how you will attempt to put your treatment units in.

Response to Comment 8

There are three primary mechanisms for resuspension of dust into the atmosphere: vehicle movement, soil movement (i.e., excavation), and wind erosion. A Site-Specific Health and Safety Plan (SSHSP) providing procedures to control, assess, and mitigate dust resuspension from these mechanisms will be prepared for the OU 2 surface water IM/IRA Project. This Plan will be prepared after the design phase of the Project is completed and will be based on guidance presented in the ER Health and Safety Program Plan (ERHSPP) and the Plan for Prevention of Contaminant Dispersion (PPCD). The safety of the workers and the public is a top priority in all ER cleanup activities. Dust mitigation procedures will be developed for specific IM/IRA construction and operation activities based on the guidance provided in the PPCD. Example techniques include windscreening, soil pile covering with wind impervious tarps, soil wetting with a mobile spray curtain, etc. A combination of one or more of such techniques, when applied per PPCD guidance, provides for effective dust suppression.

Comment 9

The study indicates that you're unable to quantify colloidal material between .1 and .45 microns. This is considered as significant failure considering the earlier studies that were already cited. It's important to identify the solubles versus the insolubles. If they're soluble, they may be amenable to precipitation and flocculation techniques. But, if they are insoluble and less than .01 microns in size, how do you intend to deal with those particles?

Response to Comment 9

The surface water analytical data shown in Volume II of the Surface Water IM/IRA Plan is of two types: "Total" and "Dissolved". "Total" concentration data is obtained by analyzing "raw" or unfiltered samples. "Dissolved" data is obtained by filtering a portion of the collected water sample through a 0.45 μm filter prior to analysis.

The "dissolved" data, therefore, reflects soluble contaminants plus contaminants associated with particulates smaller than 0.45 μm in size. Analysis of aqueous environmental samples in this manner is the accepted industry standard.

The IM/IRA treatment system addresses the removal of the insoluble particulate contaminant fraction, including particulates smaller than 0.45 μm in size, with the coagulation/flocculation mechanism. Coagulation is the process whereby the particulate electrical charges (i.e., the force responsible for keeping the particles suspended in solution) are effectively neutralized. With the charges removed, the particulates aggregate or "floc" to sizes allowing them to be filtered out of solution along with the contaminants adhering to the insolubles. Also, particles smaller than 0.45 μm may adsorb onto or become enmeshed into the ferric hydroxide floc that will form from chemical additions.

Comment 10

There is some discrepancy in the air contamination Section 2.3.6. The ambient air concentrations are stated as approximately within 20 x 10^{-6} picocuries per liter. A liter is a water measurement, not an air concentration measurement. That should be corrected to be picocuries per cubic meter if that's what your intention is. Also, the Gerhardt-Langer Report on resuspension indicated much greater levels of plutonium and americium air contamination due to resuspension, as well as the historical data from the DOE. Environmental Measurements Lab in New York indicated greater than 5,000 picocuries. So, I would urge you to do some correction of those figures.

Response to Comment 10

The "liter" is a measure of volume (liquid or gas) as is the "cubic meter." The conversion factor relating these volumetric units is as follows: 1000 liters/cubic meter. Applying this conversion factor to the referenced DOE guideline datum of 20 x 10^{-6} picocuries per liter results in an equivalent concentration of 20,000 x 10^{-6} picocuries per cubic meter.

There are currently three ambient air monitors (S-7, S-8, and S-9) in the 903 Pad and Lip Area under the Radioactive Ambient Air Monitoring Program (RAAMP). The data reported by these monitors are typically between 0.2 x 10^{-6} pCi/ℓ and 1.0 x 10^{-6} pCi/ℓ.

Comment 11

The 881 Hillside, we're concerned about recharge and seepage going downgradient to that area and how heavily it will be impacted and that the french drain system also be looked at in terms of interaction between these two OUs.

Response to Comment 11

The reach of Woman Creek due east of OU 1 (surface water and ground water) is potentially impacted by both OU 1 and OU 2. Potential hydrologic interactions between OU 1 and OU 2 will be evaluated during the Phase II (OU 2) and Phase III (OU 1) remedial investigations scheduled to begin in early 1991. In addition, monitoring data will continue to be collected to evaluate the effectiveness of remediation after implementation of the OU 1 and OU 2 IM/IRA.

Comment 12

Also, in terms of the identity of the radionuclides you're dealing with here, you have 17.70 picocuries per liter of dissolved fraction notated versus 632 picocuries per liter of gross alpha total listed here. Is this representative of the insoluble and colloidal fractions versus soluble dissolved species? Also, in terms of the identity of the isotopes involved, we would urge you to have a more complete characterization for identification so the potentially responsible parties, such as Coors from the Project Pluto dumping out there, can be brought in as a co-responsive party on this cleanup. And, there should be some undertaking of correction of the sampling deficits so that all the isotopes can be identified.

Response to Comment 12

The last column of the computer worksheet in Appendix F calculates the flow weighted maximum concentrations of the contaminants found at the individual OU 2 surface water seeps and stations. For gross alpha, "dissolved" and "total" concentrations are calculated at roughly 17.7 and 632 pCi/l, respectively.

The flow weighted maximum concentrations represent a hypothetical worst case scenario wherein the historical maximum concentrations of a contaminant (gross alpha in this example) are observed simultaneously in all IM/IRA collection systems.

As discussed in the response to Comment 9, a "dissolved" concentration data point reflects solubles plus contaminants adhering to insolubles smaller than 0.45 μm in size. A "total" concentration data point is a measure of soluble concentration plus all particulate-related contamination.

Refer to the response to Comment 6 for a discussion of radionuclide analysis for aqueous samples.

COMMENTOR: **Dr. Gale Biggs**
Director, Rocky Flats Cleanup Commission

Comment 13

My interest in reviewing this document was in the meteorology and air quality portions and how that was addressed in terms of safety and health. I reviewed the interim remedial action plan and decision document for guidance on how the issue of any plutonium-tainted dust from the proposed remediation actions would be controlled. My concern in this regard is that in discussions with people from Rocky Flats they have stated that somewhere between 60 to 99 percent of the plutonium that leaves the facility comes off as refloatation dust. What this says to me is that if you shut down Rocky Flats, clogged up every one of the vents, allowed nothing to come out of any of the buildings, you still have cut off less than half of the plutonium that's coming off from that facility. So, dust is a real concern to me and this was one of Mr. Greengard's presentations in terms of this being a source of it.

When one looks at the sources of resuspension of plutonium dust, the 903 Pad looms up as one of the major sources of plutonium from the Rocky Flats facility. So, therefore, anything that disturbs the soil in this area is going to be releasing plutonium. From that point of view, careful mitigation is a necessity. So, I reviewed the 903 document for answers as to how mitigation measures would control these emissions. The 903 document did raise several serious issues, but in my mind it completely missed others. But, even more important, none of these issues that were raised in the 903 document were discussed. They simply referenced other documents.

So, I immediately turned to Chapter 9, the reference section, to obtain details on these references and they were not listed. Hence, my reason for getting up earlier in the question and answer session and asking where are these documents? Do they even exist? I guess, I'm sorry, Tom, I was not comforted by your answers. In my mind, disturbing the soil out there and mitigating this refloatation of dust is an extremely serious issue and to simply reference in the 903 document that these are taken care of in other documents that don't even exist, that's lacking. That can't be an acceptable answer.

So, I guess what my bottom line conclusion is that, one, no work should start at the 903 Pad until these documents are not only available, but have been approved by outside scientific review and, more specifically, by a public comment period because they are important enough that they need to go through the full process. So, I don't even think this plan should be approved until those documents are available and have gone through the process.

Let me give a specific example, just one, that is that a reference was made in the wind speed and wind direction for construction and simply referenced the guidance of the 881 Hillside site. First off, the remediation action plan for the 881 Hillside doesn't even recognize the existence of radionuclides as being a problem at 881. And, yet, here we are now in the 903 Pad where it is even recognized as a major problem and we're simply using the same guidance that we were at 881. Again, I've not seen this guidance in writing. I've heard about it. Specifically, the wind speed goes about 15 miles an hour, then construction activity stops. I commented on that one as not being adequate. Dust starts blowing at about 10 miles an hour average wind speed, not at 15. So, here we are at an even more sensitive site where we know plutonium dust is a problem and we're using the same guidelines that we were for 881 where radionuclides weren't even really recognized as being a problem. So, this seems very inadequate to me and I think it needs to be detailed very carefully before any more action goes on.

I guess I have four recommendations that I'd like to toss out that you consider at this point. The first one, that plan be modified, that all construction activities cease at a 10 mile an hour wind speed averaged over a 15 minute period. Two, that all construction activities cease at peak wind gusts that exceed 20 miles an hour. Three, that all surface disturbances be done in enclosed shelters. Four, once construction has stopped because of a wind speed alert, that it does not restart for at least an hour after the last 10 mile per hour reading is observed. If I understand the guidance from 881, within

15 minutes after the wind drops below 10, you can go back to work irrespective of whether it's come back up again in the next 15 minutes.

So, I think these are some guidances that need to be followed and I think that we need to see those documents that are referenced to mitigate this wind blown activity.

Response to Comment 13

As discussed in the Response to Comment 8, a SSHSP will be prepared for the OU 2 Surface Water IM/IRA Project. Dust control, assessment, and mitigation procedures specific to construction and operations activities will be contained in the SSHSP. The three health and safety guidance documents introduced in Response to Comment 8 are in various stages of completion. The ERHSPP is in a final form. An August 1990 draft of the document was submitted to the regulatory agencies for review. The DOE revised the Plan based on regulatory agency comments and resubmitted a final document to the agencies for final review. A draft PPCD was completed in September 1990 and is currently being reviewed by EPA and CDH. The PPCD will be available for public review and comment on 1 March 1991 per the draft IAG schedule. SSHSPs are prepared after the project design is finalized, because this plan provides health and safety procedures for specific construction and operation activities. The text in Section 7.1 will be revised to reference the PPCD and discuss the sequence of completion of the SSHSP within the project schedule. The ERHSPP and OU 2 IM/IRA SSHSP will not undergo formal public review but will be available to the public.

The DOE recognizes dust resuspension as a crucial issue in the successful completion of the IM/IRA Project, and work will not commence until the SSHSP discussed above is complete and approved.

The comment is made that dust is entrained into the atmosphere at 10 mph, not 15 mph. Dust resuspension by the mechanism of wind erosion is a function of soil type, aggregates, meteorological conditions, etc. Depending on these factors, dust entrainment may be initiated at velocities as low as 10 mph and as high as 20 mph. Again, dust mitigation procedures for specific Surface Water IM/IRA activities will be presented in the SSHSP. In regard to the procedures in use at the 881 Hillside, construction may be re-initiated if the average windspeed over two 15-minute periods is below 15 mph. In other words, construction activities must cease for a minimum of 30 minutes following a high windspeed shutdown.

COMMENTOR: **Penelope Pegis**
Front Range Alternative Action Group
Director, Rocky Flats Cleanup Commission

Comment 14

I would first call to your attention the work involved in the public presentation regarding the proposed cleanup of Hillside 881. You offered a work study session on relevant issues, and by subsequent information exchange, increased knowledge and understanding of specific areas of concerns were broadened. This session was of value. It was very limited, but it was of value. And, I would strongly urge similar sessions be organized in the future. I feel that if better communication between Department of Energy, the various involved agencies, and citizens' groups were facilitated, it would greatly improve credibility standing of the Department of Energy and plant management.

Response to Comment 14

We agree that workshops can be of value and will consider holding workshops for future public comment topics if time permits and the public is interested. A workshop was not scheduled for the Surface Water IM/IRA Plan for OU 2 because members of the public recently expressed dissatisfaction about the high frequency of public meetings on Rocky Flats issues. We provided presentations and answered questions about the Surface Water IM/IRA Plan for OU 2 at regularly scheduled meetings of the Rocky Flats Environmental Monitoring Council and the area municipalities. A presentation was also made at the public comment meeting on 23 October 1990. In addition, we published a fact sheet on the proposed plan that we mailed to approximately 1500 organizations and individuals on our mailing list, and we issued a press release announcing the availability of the document and the public comment meeting. Also, as with any topic, RFP personnel were and are available to answer questions that are directed to the Community Relations Division by telephone or in writing.

Comment 15

On my review of the 903 document, several issues are inadequately addressed or neglected altogether. I think the most glaring thing I'm seeing is that 881 and 903 are being treated as separate entities. The probability of cross contamination between sites is basically self-evident. Management of both operations need to work in very close conjunction and communication with one another with regard to shared exposure risks, events, and workers' safety. The 903 document downplays workers' safety issues. The assessment and plan are minimal and addressed barely superficially.

The reality is that there will be a great deal of contaminant bearing dust resuspended during construction of the treatment plant. Work at 881 is already resuspending dust and will continue to do so. The air monitors in place at 881 do not even monitor the air in real time. This is absurd.

You have been urged many times to tent these areas prior to disturbing soil and I fail to understand your continued resistance to such a logical and reasonable suggestion. Workers' safety should be a top priority in these cleanup activities. Yet, the DOE and plant management continue in an almost pathological state of denial with regard to the extent and the lethality of the materials being handled.

Response to Comment 15

The issue of controlling, assessing, and mitigating dust is addressed in Response to Comment 8.

Monitoring for airborne radiation at the levels in question at the 881 Hillside (and 903 Pad Area) is by definition a high volume air sampling technique followed by laboratory analyses of the filter media. The technology affording real time air monitoring in this application is not yet commercially available. However,

real time monitoring of dust is performed several times per work shift when earth-moving is being done. This monitoring measures the concentration of airborne particles in mg/m^3. Prior to such measurements, surface soils at the construction area will have been analyzed for plutonium and americium. The highest concentrations of these radionuclides in the soil are used as a basis for a risk assessment. This risk assessment estimates the maximum dust concentration in mg/m^3 which would keep workers and/or pubic within regulated exposure limits. If limits are exceeded, work is stopped. Note further that work is also governed by requirements to maintain soil moisture $\geq$ 15% and by the maximum windspeed criteria. Please see the Executive Summary of this document for a discussion of estimated risk to the public.

Comment 16

I find it very unacceptable that you may alter the ARARs to suit your needs. This merely continues the practice of internal review and management. It's been a long and painful history of making your own rules without ethical or honest consideration of the population that your actions effect.

Response to Comment 16

DOE is dedicated to protection of the public health and environment. There is no intention of altering ARARs for a purpose not in keeping with this intent. Please see Response to Comment 28.

Comment 17

Regarding the proposed treatment plant design, I'll touch on just -- I've got several areas of concern. When the neutralization tank effluent enters the carbon columns through the volatile organic chemical removal, there's nothing in place to test the water for any radiation or remaining VOCs before it is discharged into South Walnut Creek. The apparent and dangerous assumption is that the system will work. I would strongly urge placement of holding tanks before and after final processing in the carbon columns. This water needs to be monitored on a continuous basis and it needs to be done in real time. And, if indeed, you know, the carbon system is going to be in place prior to the radiation treatment, it is unconscionable for there to be any consideration of releasing that water into the public domain. That can't happen.

Response to Comment 17

Optimal values for the IM/IRA process operating parameters (i.e. chemical feed ratios, process stream pH, etc.) will be determined in the treatability studies. Process design, incorporating margins of safety on the operating parameters, and automatic process control systems will ensure proper treatment system operation. The need for tanks at the outlets of the cross-flow membrane filtration and GAC units to regulate discharge based on laboratory analysis results is thus eliminated. In addition, the required capacity of the holding tanks would be prohibitive for this IM/IRA. Consider, for example, a throughput rate of 30 gpm or one-half of the design flow rate. Assuming a one-day laboratory turnaround (which in itself is unrealistic), each holding tank would have to possess a capacity in excess of 40,000 gallons. The engineering and construction effort associated with installation of on- and off-line tanks with capacities to hold treated water for up to several weeks would delay implementation of the IM/IRA (see Response to Comment 149). In addition, installation of such tanks would require disturbance to relatively large land areas containing potentially contaminated soils.

Although the technology to monitor the contaminant concentrations of the processed surface water is not commercially available at this time, process variables such as flow, pH, chemical addition ratios, etc. will be monitored and controlled on a real-time basis to assure protection of the GAC units, and to produce a final effluent that meets or exceeds the treatment requirements.

Comment 18

Another area of concern is disposal of the spent filters from the solids dewatering equipment. It is proposed to ship these to Nevada for burial; however, Nevada is not accepting waste from your facility. An ultimate disposal plan needs to be augmented and very firmly in place before commencing any operations. Storage on site is unacceptable.

Response to Comment 18

We understand your concern for off-site disposal of radioactive waste given the current stoppage of low-level mixed waste shipments to the Nevada Test Site. The DOE is resolving the waste form issues that will allow for continued shipments of this waste. Waste generated from the OU2 IM/IRA treatment facility will most likely be classified low-level mixed waste that could conceivably be disposed at the Nevada Test Site.

Comment 19

Also unacceptable is the proposal to use Indiana Street as a route for the tanker trucks bearing contaminated water. Indiana Street is a heavily traveled road through a populated area. The burden of transport is on the plant and you need to figure out a transport plan that will in no way put the public at any risk. We have been the unwitting recipients of contamination through sloppy and uncaring methodology since the plant's inception.

Response to Comment 19

Because of this concern and others, seeps will not be collected in the Woman Creek drainage until further studies are completed. Please refer to our discussion of this matter in the Executive Summary.

Comment 20

I see that you have an opportunity here to at least partially remediate 40 years of irresponsive and ineffectual handling of radio-toxic substances and also to partially remediate the cavalier disregard for the public that remains unchanged to this day and I would strongly urge you to do so.

Response to Comment 20

The DOE is committed to the execution of a successful ER Program, and to establish and maintain excellent standing with the public.

COMMENTOR: **Barb Moore**
Front Range Alternative Action Group
Director, Rocky Flats Cleanup Commission

Comment 21

The first two items I wish to address relate to the execution of this hearing. First, it continues to be a problem that DOE and EG&G continue to schedule these hearings without giving interested citizens sufficient time to review the documents in question. This problem is not new. We have been through this with the IAG, 881, and now 903. There have been promises made by DOE and EG&G to correct this problem, but we have heard this before. It's time for DOE and EG&G to act. It is mandatory that these documents be distributed and mailed as soon as possible to the concerned citizens.

Number two, I would like to know why there wasn't a work study or a work session for this document? The 903 area is one of the most critical areas targeted for cleanup. EG&G and DOE offered a work study for the 881 decision document. A study session of sorts was provided for the PRMP. But, it was overlooked for 903. Could it be that EG&G and DOE are not prepared to answer the questions that would be asked? Could it be that they don't entirely understand the steps, but only have an educated guess on how to propose system will work? In the future, please provide a workshop when we are dealing with documents that involve this type of complexity.

Response to Comment 21

One benefit of public comment meetings is that participants often hear ideas that they had not previously considered. Holding the comment meeting halfway through the public comment period allows these citizens time to adequately address the new ideas and to submit written comments that reflect their consideration.

We do, however, welcome any specific suggestions for improving the effectiveness of public comment periods. In fact, during a meeting with DOE, EG&G Rocky Flats, EPA and CDH on 5 October 1990, representatives of the Rocky Flats Cleanup Commission agreed to offer such suggestions to the Community Relations Division in writing. We look forward to receiving these and other suggestions.

In terms of document distribution, copies of the proposed plan were produced and disseminated as quickly as possible following completion of the document. Understanding that the preparation of thoughtful comments on such document requires adequate review time, we will continue our efforts to make public comment documents available immediately after their completion.

Workshop sessions may be held in the future as discussed in Response to Comment 14. The IM/IRA alternatives have been thoroughly researched, and we are very confident that the proposed IM/IRA is indeed the preferred alternative based on current available technology. We encourage all public comments and questions regarding the Plan.

Comment 22

Now, about the document. Section 3.3.3 states you will consider attainment of the Clear Water Act, CWA, water quality criteria where relevant and appropriate. On the next page it states it may not be practicable to attain all ARARs for the interim action and ARAR waivers or alternate concentration limits may be requested after the study is complete. The big questions here are who decides what is relevant and appropriate? Who will issue waivers of the ARARs? Who decides that the study is complete? Who will get notified if any of these actions should take place? If the DOE is so confident that their water treatment systems described in this IM/IRA will work, then why do they need to build into it these escapes.

If the proposed technology described in this plan cannot meet all the standards, whether they be CWA, ARARs, state or any other applicable regulation, then DOE needs to go back to the drawing plan that they can guarantee will work. It simply is not good management to spend money on something that won't meet the requirements. Don't build into these documents ambiguous statements about "where relevant and appropriate are waivers of the ARARs." It only acts to further reduce your credibility.

Response to Comment 22

Our statement that ARARs need only be met to the extent practicable is simply reiteration of EPA regulations and language in the Inter-Agency Agreement (IAG). With our present information, we have chosen the technologies most likely to achieve ARARs. Please see Response to Comment 28 for further explanation of our position on this important issue.

Comment 23

Section 4-3 describes that the transport of the water from the collection systems to the treatment plant will be done with a tank truck. DOE and EG&G propose to truck this poison from the collection point south to the treatment plant. The concern here is the redistribution of soil particulates in the air that are contaminated with the plutonium and uranium. Past remediation on this site has caused high levels of plutonium to be found throughout the entire Denver metro area.

I reference a Dow Chemical report, July 9, 1971, that tells us the quantity of plutonium redistributed was directly associated with removal of the drums, physical activity, and periodic high winds. If you go back and review the data from 1969, you will find the highest readings in 1969 for plutonium in the air occurred during the times of heavy cleanup activity. It would be foolish to repeat these mistakes.

The plan to transport this collected water with a tanker truck over a public highway to get from one part of the plant to another is absolutely unacceptable. Indiana is a fast highway. In the winter when the winds start blowing, that highway will redefine for you what hazardous driving conditions are all about. There is a significant chance for accident. Why risk this? To save a few dollars? It's not worth it. The transport system for this water needs to remain on-plant and needs to be redesigned.

Response to Comment 23

Alternatives to truck transport on Indiana Street is construction of a pipeline or road on the RFP property. Both will potentially generate plutonium contaminated dust. Because of this concern and others, seeps will not be collected in the Woman Creek drainage until further studies are completed. The proposed Surface Water IM/IRA Plan dated 26 September 1990 will be revised to defer collection of the 903 Pad seeps and eliminate tank truck transport of the collected seep water to the South Walnut Creek drainage. Please refer to our discussion of this matter the Executive Summary.

Dust mitigation by vehicle movement, soil movement, and wind erosion is discussed in Response to Comment 8.

Comment 24

Page 7-2, Paragraph 2, is the only mention of a health and safety plan. Given the experiences of 881, I would think a health and safety plan would warrant its own section in this document and not hidden in a paragraph that begins with dust control. It is neglectful that this is hidden in that paragraph. The IAG has a mention in it that all the contractors and subcontractors be educated on what the IAG is and

what their requirements are under the IAG. And, I would like to know if this has been done. It certainly isn't mentioned in this decision document.

Page 4-19 says the effectiveness of this surface water collection by diversion along with implementation of dust suppression procedures during installation should result in a high degree of public acceptance. What audacity to assure that the public will endorse this technology. I don't know anyone in the public that is satisfied with the dust suppression methods that have taken place at 881. The 903 area has even higher levels of radiation. Why would you assume that we would give you our stamp of approval on this so-called plan? Perhaps if you tell us enough that we do approve something, maybe we'll do it. I don't know. But, you need to think this over. The cleanup and construction activity must be done under a protective dome of some sort. This would prevent the plutonium contaminated soil from being resuspended into the air.

Response to Comment 24

Presentation of project health and safety issues and procedures is best served by dedicated health and safety documents. These documents are discussed in Response to Comment 13.

Contractors and subcontractors involved in the construction of the OU 2 IM/IRA will be instructed of their requirements under the IAG at the time they are selected.

Dust suppression is discussed in Response to Comment 8.

Comment 25

Page 7-3, in regard to the carbon columns, I would also like to ask will the carbon columns be tested for radioactivity and will the water be tested prior to entering that column? It would seem prudent to construct a small setup in a laboratory to test the proposed technology prior to spending hundreds of thousands of dollars before we implement it.

Response to Comment 25

The carbon columns most likely at risk of becoming contaminated with radionuclides are those used in the field treatability study. Although suspended solids will be removed prior to carbon treatment and the suspended solids fraction contains most of the radionuclides, the schedule does not allow for the precipitation/adsorption/filtration technology to be in place by March 1991 to further protect these units from accumulation of radionuclides. However, this is the field treatability study phase of the project and is limited in duration. Long-term operation of the complete treatment system should not result in generation of radioactive carbon.

During the IM/IRA it will not be practical to store and test the water for radionuclides prior to treatment with activated carbon (see Response to Comment 17). However, if results of treatability testing indicate that carbon may exceed allowable levels for radioactivity, it may be necessary to reevaluate the proposed technologies. As a matter of characterization for disposal, the carbon will be tested for radioactivity before and after use.

Comment 26

The last thing I have to comment on at this time is that the DOE should instruct EG&G to design a water treatment plant that would be able to treat all the water destined for treatment in the IM/IRAs that we're going to be looking at with this IAG. It seems like a tremendous waste of money to be building

separate treatment plants for 881 and 903 and who knows what other treatment plants we're going to have to build in the future. I would like to see a system designed that could handle all of the problems out there.

Response to Comment 26

A large, multi-unit, centralized treatment plant was actually considered prior to design of the OU 1 IM/IRA. Unfortunately, inadequate design information exists today on the flow and influent water quality characteristics for such a plant to permit design and construction. However, the concept of a centralized treatment facility is under evaluation for future remediations requiring water treatment because of its obvious favorable operational and economic benefits. Please note that the DOE has begun planning for a centralized, state-of-the-art treatment facility for off-site discharges. Such centralized treatment would replace the temporary treatment systems now in operation at the terminal detention ponds.

COMMENTOR: **Joe Tempel**
President, Rocky Flats Cleanup Commission

Comment 27

I just wanted to, first of all, thank you for this format. It was at least better than nothing in terms of the information provided at the beginning to give us an opportunity to ask questions. But, I would support even a longer time to ask questions or a separate meeting to be able to address questions so that our comments later on would be more meaningful. But, I appreciate the time that you gave us at the beginning of the meeting.

Response to Comment 27

We are encouraged by your comments and are glad to see that information transfer is taking place with regard to the surface water IM/IRA Project for OU 2. The initial question period will be maintained in future public meetings related to ER Program projects.

Comment 28

I would like to follow up on a question that I had on the ARARs. That even though the plant is not required to meet the ARARs, I would like to feel that the requirement would be placed on them because of the time frame between now and when the final action would be in place. And, as far as I could tell from the graphic, it's going to another six years before the final action is in place and then the ARARs would have to be met. So, I would like to think that everything possible would be done to meet the ARARs now for the next six years.

Response to Comment 28

We believe you may misunderstand the concept of the extent to which ARARs must be met for IRAs. The NCP and IAG call for meeting the ARARs to the extent practicable. Under no circumstances does the DOE interpret "extent practicable" as allowing discharge of water that may pose a threat to the public health or environment. Any waiver of an ARAR granted by EPA and CDH will carefully consider technical and risk factors. It is important to recognize that the treatment system will improve the water quality now entering the B ponds regardless of whether all ARARs are fully achieved. This should assist current actions to achieve Water Quality Control Commission Segment 4 in-stream Walnut Creek standards before discharge from Pond B-5.

Comment 29

There was a statement made on Page 6-8 that surprised me a little bit as careful as you were throughout the process in describing the filtration system and the GAC system. That when you get the filter cake collected in the bottom of the filter that you're going to flip it in a dumpster. That seemed a little bit crude to me and I'm sure it's a little more sophisticated than that, but I would be interested in what this dumpster looks like and how the worker is protected and that it's more of a sealed system than a dumpster that we find out in our alleys. I'm sure that's not what you mean, but it seemed a little crude when I read it.

Response to Comment 29

The filter press sludge cake transfer system is more sophisticated and protective of workers than the text in Section 6.1 indicates. The press is mounted on an elevated platform with a catwalk, railing, and stairs. A series of chutes contain and direct the filter cake as it falls from the press. The top of the chutes are designed to extend above the bottom of the press (i.e. overlap) to provide splash protection. Fifty five gallon drums are placed under each chute outlet to collect the cake. Splash guards are also skirted around the chute outlets to provide splash protection. The text in Section 6.1 has been revised to provide the above description of the sludge cake handling equipment and operation.

Comment 30

> *I would also like to follow up on the previous speaker's request for a community relations plan and a health and safety plan. These both should be in place and have been reviewed by the public before construction begins. We went around on this on the 881 and we still aren't comfortable with the health and safety plan for 881. And, we figure that was just practice compared to the 903 Pad Area where there's a much more serious risk involved with disturbing the dust because it does have much more plutonium than 881. And, those dust controls on either 881 or 903 have not really been addressed to our satisfaction. We're still awaiting the - I don't know the exact title of the report, but it was one that we've been promised previously on the dust control study that will address all technologies to control dust, not only just wetting it but also covering the entire site with a portable shelter and protecting the worker while he or she is inside that shelter. We feel this study should be complete and submitted to the public for review before actions begin at 903 Pad and Trench and Hillside.*

Response to Comment 30

In accordance with the schedule set forth in the draft IAG, the Community Relations Plan will be available for public review and comment on 30 January 1991 and will be implemented in August 1991. Although the plan is not yet in place, we are currently meeting the community relations requirements of RCRA, CERCLA and the draft IAG.

The development of an Interim Community Relations Plan, which was requested by members of the public during comment on the draft IAG, is currently underway. A draft interim Community Relations Plan was provided to EPA, CDH, area municipalities, the Rocky Flats Environmental Monitoring Council and the Rocky Flats Cleanup Commission for informal review and comment. Implementation of the Interim Community Relations Plan is scheduled to occur in January 1991.

Health and Safety Plans are addressed in Response to Comments 8 and 13.

Comment 31

> *We'd like to congratulate you - I'm speaking for Joe Goldfield this evening who likes to speak on synergism and additive effects, but at least as far as I can tell on page 7-10, you did make the reference that the contaminants are additive and this is something we've been arguing all along. It is consistent with the EPA guidelines for estimating health risk and we are glad you finally recognized that and are following the procedures. What is missing though is the calculations that went along with that to show us how you did add up those individual risks to come up with your final risk assessment which is pretty sketchy in Chapter 7. I would like to have an opportunity to review that risk assessment to see how, in fact, you did add each of those individual risks and summed them for the total carcinogenic risk.*

Response to Comment 31

For ease of reading, we chose not to include all the calculations that demonstrate the risks to the public are inconsequential. These low risks arise from phthalate and radioactive contaminated fugitive dust inhalation, and fugitive volatile emissions inhalation during operation of the IM/IRA. Calculations are provided in Attachment 1.

Comment 32

I would also like to encourage some kind of a holding tank between the two systems for treating radionuclides and the VOCs. I'd hate to contaminate a whole barrel or a bin of carbon that would just have to be treated as another waste if some of the radioactive pollutants did get into the carbon system. It appears to me that it isn't sufficient just to take individual samples just to see if it's working because it you do get a bad sample, then you've polluted that carbon system. It seems like there should be an interim tank to test periodically before you send it on through the carbon system.

Response to Comment 32

The issue is addressed in Response to Comment 17.

Comment 33

Even though this amount may be a minor amount, the general public would feel much better if you recycled it back through the plant. You're putting in pipes and it seems like there should be a way to connect it to some kind of system out there that could be recycled back into the plant to support the concept of a zero discharge from the plant.

Even though you folks are dealing with the restoration end of it, there's others that deal with the NPDES part of it for operations and the goal is zero discharge. And, if you can deal with that on individual OU basis, we would appreciate it. And, I think the health department would, too, since they issue that NPDES permit.

Response to Comment 33

The DOE is aggressively studying measures to achieve the goal of zero discharge. For example, the DOE is engaged in planning a project to recycle water from Pond C-2 (which discharges into Woman Creek and ultimately Standley Lake) into our industrial water loop, for use in cooling towers and boilers. Completion of this project is scheduled for 1991. Unfortunately, for the South Walnut Creek portion of the OU 2 Surface Water IM/IRA, the schedule does not allow for water resource planning, and treated water will be returned to South Walnut Creek. Consideration for recycling treated 903 Pad Area seep water will be given when the IM/IRA Plan is modified.

Comment 34

Part of that permit is normally a requirement for that biomonitoring is my understanding and, as far as I know, you're doing it now for that permit. So, I think the previous comment to at least prove that the water is good enough for minnows, maybe we'll feel a little bit better about it that it's fit for humans.

Response to Comment 34

Biomonitoring is a proposed requirement for NPDES permits under the FFCA. The DOE is currently conducting biomonitoring on a monthly basis at Ponds B5 and C2 in anticipation of promulgation of the requirement. In any event, the purpose of the IM/IRA is to remove specific pollutants upstream of the NPDES discharge point. This will improve downstream water quality where biomonitoring is required.

COMMENTOR: **Kim Grice**
Director, Rocky Flats Cleanup Commission
Member, Colorado Association of Realtors

Comment 35

To begin, IM/IRA for the OU2 to remediate contaminated surface waters must not proceed as did OU 1, the 881 Hillside. We're appalled that there is still no community relations plan implemented to inform the public. DOE and EG&G are not involving affected citizens in the continued cleanup process at 881 and we fear the same will occur at 903. It is stated that the public under Superfund laws shall be involved in the oversight of cleanup.

One method toward establishing accountability would be to publish and distribute a bi-monthly remediation progress report for each site. The report should include, but not be limited to, the following data and information: (a) a brief description of summary of work performed and by whom; (b) dates the site was inspected by Colorado Department of Health and EPA and by whom; (c) equipment log (type used, hours used, rad inspections, detox owner); (d) worker log (number used, hours at site, individual radiation badge counts, daily radiation count on worker clothing at end of each shift; (e) site-specific wind rose data (for example, direction, speed, frequency, shutdowns); (f) site-specific soil sampling (when, how, where with in situ percent of respirable dust, characterization, etc.); (g) site-specific air monitoring (wind, type of, locations, data, etc.); (h) weekly inspection reports on work of compliance to OSHA regulations; (i) removal of soil (for example, characterization, cubic yards, deposited where, when, how); (j) water seepage (characterization, amount, pump, when, and where to); (k) minimum of two pictures of current construction and the layout, a site layout.

We find it distressful that some citizens are denied copies of OU2, the IM/IRA texts number I and II, because it costs $40. Not speaking for the Rocky Flats Cleanup Commission, but as a participating director and citizen, you know, we've been denied numerous times when we requested multiple copies of documents for each of the 15 board members. The point I want to make is it should be to DOE's advantage to supply any concerned citizen, bureaucrat, or scientist with a copy of a report which shall be open for public comment. But, we were informed that there was a potential demand for these documents that was between 25 and 90 sets. So, at $40 each, this would be approximately $3,600. I would say the return on this minor investment would be 100-fold by way of technological insights into better processes, the discovery of potential inadequacies, and improving good will. As some would say, the mind is a terrible thing to waste.

Response to Comment 35

The ER CRP and its availability to the public is discussed in Response to Comment 30.

Site progress reports will be made available as a requirement of the CRP. Some of the information gathered during oversight activities may be used for enforcement action purposes and, therefore, may not be released to the public until the action is a matter of public record.

We agree that public documents should be available to all interested parties, and, to the extent possible, we provide individuals with requested DOE documents. Unfortunately, costs are a factor, and we try to mitigate budgetary impacts by making documents available to the public at four public reading rooms and by encouraging groups such as the Rocky Flats Cleanup Commission to share or to copy documents at minimal cost at the DOE Public Reading Room at the Front Range Community College Library.

After discussing document availability with the Rocky Flats Cleanup Commission on several occasions, we negotiated an agreement on 5 October 1990 to provide the group with 10 copies of all cleanup-related documents distributed for public comment. DOE, EG&G Rocky Flats, EPA, CDH and six directors of the Rocky Flats Cleanup Commission participated in the meeting.

Comment 36

All right. Now, I would like to proceed with my comments in a somewhat sequential order starting with the table of contents found in Volume I. Number one, numerous types of measurements were used within this report. It would seem appropriate to include conversion charts.

Response to Comment 36

The cost calculations for the surface water collection and treatment system alternatives examined in Section 4 of the Plan employ the following conversion factors:

- horsepower per kilowatt
- gallons per cubic foot
- pounds of water per cubic foot

These conversion factors will be stated explicitly in the document to aid the reader in understanding the cost calculations. Specifically, the conversion factors will be listed in the appropriate cost tables for quick reference while examining the tables, rather than in the table of contents.

Comment 37

Two, the report did not identify PRPs, primary responsible parties.

Response to Comment 37

Determination of PRPs for contamination at the RFP is a complex legal issue not germane to the implementation of the Surface Water IM/IRA. At this time, the DOE is soley pursuing RFP environmental clean-up projects.

Comment 38

Three, the surface water contamination addressed in OU2 demands treatability by constructing a treatment facility. Since there are other surface waters that need remediation found in other OUs, like from the A, B, and C Series ponds and the drainages of Woman and Walnut Creeks, why not build a facility with a capacity and technology to remediate all Rocky Flats surface water runoff and ground water? After treatment, why not recycle and reuse the effluents so, in effect, DOE would be accomplishing zero discharge to the public domain? And, by the way, how do we know that the surface water seeps aren't actually ground water which has surfaced?

Response to Comment 38

Please see Response to Comments 26 and 33. The document provides several references to seeps representing the surfacing of ground water

Comment 39

Four, the maps used in Section 2 called Figure 2-1 and Figure 2-3 lack sufficient detail and updating. Demographical data is scarce or covers too broad an area away from the primary affected area of concern which should be within six miles. A population distribution quadrant map around Rocky Flats should be included. This diagram would chart the population in various sectors and subsectors out to six miles. CDH does sectoring with their soil survey analysis and the two data bases could be helpful in future studies in dose risk analysis.

Response to Comment 39

The purpose of Figure 2-1 is to give the reader a general, one-page introduction of the location of the RFP within the State of Colorado and the Denver Metropolitan area. The level of detail is appropriate for this purpose, however, the accuracy of the base maps used to create Figure 2-1 will be examined and replaced with current versions, if appropriate.

The land use and demographic information presented in Section 2.1.3 and Figure 2-3 is based on a 1973 Colorado Land Use Map and 1980 Census data, respectively. The text and figure will be modified to include the most recent data from these sources and to include more detailed information on the area immediately surrounding the facility.

Comment 40

Five, there was no mention of meteorological or ambient air monitoring. The remediation of surface waters involves construction of some pipelines and the use of trucks to transport effluents from pumping sites over gravel roads, thus causing resuspension of contaminated respirable dusts in the size of less than 5 micrometers. Why weren't wind rose data and other meteorological information included?

Response to Comment 40

Please see Response to Comments 8 and 13.

Comment 41

Six, the carbon tetrachloride isoplethic map did not account for the 1600 micrograms per liter found in well 1-71 nor did it account for 1,560 micrograms per liter in Well 42-86. The tetrachloroethane isoplethic map did not account for 120,000 micrograms per liter found in Well 1-74 nor 450 micrograms per liter in Well 3-74 nor 320 micrograms per liter in Well 42-86. The trichloroethane isoplethic map did not account for 14,000 micrograms per liter found in Well 2-71 nor the 4500 micrograms per liter in Well 2-71 nor 7,000 micrograms per liter in Well 1-74. These concentrations were detected in 1986. Where has these constituents been transported to if they are not now detected in said concentrations?

Response to Comment 41

As stated in Section 2.3.2.1, the isopleths for carbon tetrachloride, tetrachloroethene and trichloroethene are based on second quarter 1989 ground-water data. The isopleths are intended to give the reader a snapshot of the latest quarter of data available at the time this document was prepared, and not to ignore higher maximum concentration data obtained prior to the second quarter 1989. Explanation of variations in historical ground-water contaminant data is speculative due to the nature of the system. Reasons for changing

concentrations include biodegradation, dispersion, changing conditions at the contaminant source, ground-water levels, etc.

Comment 42

Seven, isopleths showing other chemical and radionuclide concentrations in surface and ground water were not included. Why?

Response to Comment 42

Isopleths are useful for illustrating the areal distribution of a contaminant. Examination of the data shows that the presence of carbon tetrachloride, tetrachloroethene, and trichloroethene in OU 2 ground water is widespread and consistent over time more so than any other contaminant. Isopleths are, therefore, particularly useful for these three volatile organic compounds. In any event, surface and ground-water data for all contaminants is presented in Volume II of the Plan.

Comment 43

Eight, surface water radionuclide standards used are not based on natural background levels for the region or the United States. Why? For example, the natural background levels for plutonium in surface water is .001 picocuries per liter. Why shouldn't ALARA, as low as reasonably achievable, be a designated goal along with ARAR requirements, whichever is more stringent? What are the U.S. natural background levels for these chemicals, metals, and radionuclides in surface water?

Response to Comment 43

Background levels for chemicals, metals, and radionuclides are regionally dependent. The Water Quality Control Commission radionuclide standards are considered to be protective of the public health, and are based, in part, on estimated background levels for Colorado and specific vicinities. See Response to Comment 51 regarding achieving background levels for cleanup.

Comment 44

Number nine, it is my understanding that this IM/IRA by law must aim to be consistent with a final remedy. This report ignores a potential health concern. Why delay? Why not begin reviewing the synergistic effects of the chemicals and radionuclides? RODs on other Superfund sites may have already addressed synergistic effects has DOE attempted to review these other RODs for this data.

Response to Comment 44

DOE fully intends this IM/IRA to be consistent with the final remedy. We acknowledge the need to address cumulative cancer risks in Item 3 under Section 3.3, i.e., the final remediation must consider for carcinogens, concentration levels that represent an excess lifetime individual cancer risk less than 10^{-4} considering multiple contaminants and multiple pathways of exposure. We have supplied the cancer risks for each chemical in Table E-1, (assumed to be additive for risk estimation purposes), which is further discussed in Section 3.3.1.5. Please refer to Response to Comment 116.

Comment 45

Ten, many documents cited within this report were not included in the reference section nor was the public given an opportunity to review them.

Response to Comment 45

The list of sources presented in Section 9 will be cross-checked with all references cited in the text and updated, as required. DOE documents referenced in the Surface Water IM/IRA Plan which are approved by the draft IAG for public dissemination may be reviewed at any of the four public document repositories. Please contact the EG&G Community Relations Division for information concerning the availability of specific documents.

Comment 46

Eleven, there is some doubt if radionuclide concentrations in this report reflect accurately the 1986 concentrations found in wells located within OU2.

Response to Comment 46

The 1986 radionuclide concentration data for OU 2 ground water will be reviewed and any discrepancies with the summarized data presented in the Surface Water IM/IRA Plan will be discussed.

Comment 47

Number twelve, the reverse osmosis treatability process was not studied. Why not?

Response to Comment 47

Reverse osmosis (RO) is a membrane filtration technology designed specifically for reduction of total dissolved solids. RO is not appropriate for the trace radionuclide and metals removal application posed by OU2 surface water. The technology can, therefore, be eliminated in the absence of detailed evaluation.

Comment 48

Thirteen, future water studies should try and develop three dimensional plumage, promote cluster wells at various depths.

Response to Comment 48

DOE is currently investigating three-dimensional ground-water transport and plume dispersion modeling. Additional hydrogeologic data is first necessary in order to adequately calibrate the models. Well clusters are proposed in the Phase III OU 1 and Phase II OU 2 RFI/RI Work Plans when saturated thicknesses exceed 10 feet.

Comment 49

Fourteen, solubility of plutonium and other radionuclides have not been fully addressed in the monitoring and treatability processes.

Response to Comment 49

Please see Response to Comments 6 and 9.

Comment 50

Fifteen, it would be naive of us if we did not ask the question how can we be assured that the surface water results in this report and future ones meet quality control criteria for analytical procedures. Our concern is derived from an August 1987 report called final memorandum to EPA by PRC Environmental Management, Inc. They stated that there's been a problem with lab results for Rocky Flats. For example, and I quote, "the analytical laboratory exceeded the volatile holding time. Volatile results should be considered unreliable." Also, another quote, "the chloroherbicide results should be considered unreliable due to blank contamination."

Response to Comment 50

Quality assurance has become a primary directive of DOE for all facets of waste operations, including the ER Program at the nuclear weapons installations. At the RFP, all sampling and analytical activities have been conducted in accordance with QA/QC plans. Currently, these activities are performed in strict accordance with the General Radiochemistry and Routine Analytical Services Protocol (14 September 1990). An independent contractor determines the quality of the data generated through a rigorous validation program where QA/QC documentation is reviewed for adherence to the protocol. Also, please note that laboratory quality problems were discussed by DOE in the first RI report dated 1 July 1987.

Comment 51

And, in closing, I want you to remember that clean air and clean water was here before Rocky Flats. I personally believe that this dirty facility ought to clean up their polluted sites to meet natural background levels found elsewhere in the United States. Rocky Flats should also attempt to recycle and reuse all effluents. The public wants a zero discharge even if it is treated waste. And, finally, Rocky Flats should definitely eat its own waste.

Response to Comment 51

A primary tenet of EPA Superfund policy is to clean up historical hazardous substance release sites to levels protective of the public health and the environment. In some cases, this may necessitate achieving background levels for some constituents. DOE is committed to following this policy. It is important to note that cost effectiveness is also an EPA criterion for determining the preferred remediation alternative. It is important to remember that cleanup costs are ultimately born by the citizens. Cleanup to achieve background for all constituents may be exorbitant and provide little value-added to the public relative to cleanup that is less stringent yet protective of public health and the environment.

Please see Response to Comment 33 regarding water recycle.

COMMENTOR: **Abraham Black**
Former Employee, Dow Chemical Company

Comment 52

I'm greatly concerned and not exactly well-pleased with some of the work that I was ordered and detailed to do that brought me in contact with some hazardous material that I didn't know anything about and neither was I hired or paid to know anything about this. And, I brought this to the attention of what I believed to be the Department of Energy. It's an arm of the Federal Government. I've never received any kind of an answer for it.

I spoke previously and I understood one man to say something to mention I should take it up with Dow Chemical Company. But, when I talked to this man during break time, he didn't know - he said he didn't know anything. He couldn't confirm anything that I should ought to do. But, he did mention see the elected officers. I think David Skaggs was mentioned. All claims that I've ever heard ever being settled from any results of Rocky Flats by any contractor was settled through a court of law. And, I think the Federal government should be on the side of the people and not the defendant, the contractor, and when some reasonable evidence is presented that a contractor has endangered the life or health of any employee or any other people, a deep study should be made in great consideration as to whether this contractor will continue to contract for the Federal Government.

I've never heard of any Federal employee or a management or a person of supervision to ever be affected by any of the ill-effects of what they come in contact with at Rocky Flats, regardless of the contractor. The question there could be as these supervisors and these well-trained and educated people have more knowledge than we do and that they stay clear of all this hazard. When just a common craftsman that's working as a craft or trade, he's going to do his work as he's told to do. But, a supervisor and a Government person, they kind of, more or less, pick and choose what they come in contact with.

This could go on all night long, some kind of a resolution, what we're going to do about this. Hold up all production, not the cleanup, not some precaution or preventative or something like that. We're talking about production where they open up new containers and new barrels of that stuff that I helped bury. And, hold that up until all questions and claims have been given - been addressed proper. Or have some kind of a settlement made.

And, the second one, to see our elected officers and express ourself, how we feel about what our own Federal Government that we have supported so well is doing to us. I believe that concludes. We could go on with this all night long, but this is all I feel like doing tonight.

Response to Comment 52

We are very concerned about your stated health problems, and as we expressed in letters to you dated 5 July 1990 and 15 November 1990, we invite you to the Rocky Flats Plant for a complete medical examination in our Occupational Health Services Department at our expense. The examination would include a chest count in our body counter facility and a bioassay analysis for uranium, plutonium and americium through urinalysis.

COMMENTOR: **Marcia Bryant**
Arvada resident

Comment 53

I'm really upset about the lack of availability of the documents to the public. I have not yet had a chance to obtain a document to look at because my working hours really constrain me from going to one of the four places where this is available. So, I feel like there should be more community relations between the plant and the public in order to get copies besides these four places that close at 5:00 o'clock. When people work past 5:00, it's a little hard to get there, and if they're not open on weekends, then you're sort of out of luck. So, I reiterate what Kim Grice and some other people have said about this.

And, I'm basically speaking as a concerned citizen. I would just like to get more availability of all the documents, the safety concern documents, the health problem documents, whatever is available, and Dr. Gale Biggs mentioned some documents that aren't even complete yet and yet they're talking about going ahead with this plan without the documents being complete and available to the public. And, I feel as a public citizen, we are entitled to see these documents. Even if they're in draft form, we still should be able to see them.

Response to Comment 53

In most cases, we are able to fulfill citizen requests for DOE documents. If for some reason we are unable to do so, we refer interested parties to the public reading rooms where they can review the documents. This topic is also addressed in Response to Comment 35.

We realize that many citizens who are interested in Rocky Flats issues work during the day and cannot use most of the public reading rooms during their normal business hours. The DOE Public Reading Room at the Front Range Community College Library, therefore, is open until 8:00 p.m. every Monday and Tuesday.

The project health and safety plans and their availability to the public is discussed in the Response to Comment 8.

Comment 54

I feel since I am a native Coloradan, the only - I've spent one year out of the state since I've been alive. So, I feel like I've had a lot of constant exposure to plutonium, among other chemicals, that are in the ground and the water. And, when I moved to Arvada about 15 years ago, I said jokingly there's plutonium in the water out here, I hope you people know this. Well, that's - you know, several of you joke because it really is true. So, I think it - unlike the slides Tom Greengard showed, I believe earlier, that it's not an immediate threat to the community and the workers, I feel this is an untruth and a lie.

So, I feel that really the only way to clean up Rocky Flats - and I have been working with the Rocky Flats Cleanup Commission - is to shut the place down and I hope this is done soon and before my children grow up.

Response to Comment 54

The air and water monitoring data collected at the RFP indicate the risk to the public from exposure to plutonium and other chemicals is inconsequential. Nevertheless, DOE remediation efforts are being designed with the goal of complete cleanup of the RFP. DOE is developing an expanded, integrated site-wide monitoring system, the goals of which will be to fully characterize conditions at the site, to identify any previously unidentified areas of contamination, and to provide a benchmark against which the success of our

remediation efforts can be gauged. The goal of a complete site clean-up is a number of years away, but that goal will be achieved.

Closing of the RFP, and the relocation of this weapons manufacturing facility and other weapons manufacturing plants in the DOE complex, is a matter that is already under active consideration. Admiral Watkins is evaluating a plan in which nationwide weapons production would be centralized at two remote sites, yet to be determined. Were it to be approved and funded, Rocky Flats would continue its plutonium operations for the intervening years.

COMMENTOR: **Dr. Eugene DeMayo**
Chairman, Sierra Club of Colorado

Comment 55

I, too, was not able to review the document due to its unavailability, but tonight I've reviewed a number of summaries and things here and have a few comments to make based on that.

Number one is document availability. There really is no excuse for not making these available to any citizen who feels like they want to review it and comment on it and that has been a problem continuously with these. They may be expensive, but compared to the operation going on, they're cheap. So, if they're copied on two sides of the paper and you increase the number of copies you make, you will find that the price goes down quite considerably.

Response to Comment 55

Please see Response to Comments 1, 35, and 53.

Comment 56

The fugitive dust problem was something that was commented on the 881 Hillside, it's come up here again, and yet there's still no real solution for either site as to how it's going to be monitored in real time or whether or not the use of an enclosure will be taken up which is probably something DOE should be investigating very carefully as whether or not that type of protection on the site would be reasonable to do, enclosing it in a portable building to reduce the amount of fugitive dust and also allow the workers that work in that area to wear better protection gear and protect the workers while they work in there, as well as the citizens off-site when the dust blows around.

Response to Comment 56

The real-time monitoring issue is discussed in Response to Comment 15. Mitigation of fugitive dust is addressed in Response to Comments 8 and 13.

Comment 57

It again came up tonight about contractor education about the rules of the IAG. This has been something that came up with the IAG and the Hillside 881 comments and again here. There's no indication that I noted when I talked to people who have actually read the document that the contractors will be educated as to what the rules and regulations that they must follow are. There are quite a few unanswered questions when it came to the 881 Hillside and the contractors being used and what they knew about how to protect themselves and their workers and not to track the stuff off-site.

Response to Comment 57

Please refer to Response to Comment 24. The IAG lays the foundation for preparation of the ERHSPP, PPCD and SSHSP. The SSHSPs are reviewed and signed by the contractors to attest to their understanding of the hazards and procedures to minimize exposure to contaminants during remedial activities.

Comment 58

Community relations plan and health and safety plan, come on, this is obvious. These things should be in place if we're going to go ahead with these types of operations. Getting those documents or those plans together is really imperative to the ongoing cleanup at Rocky Flats.

Response to Comment 58

Please refer to Response to Comment 30.

Comment 59

Finally, the referencing of non-existent or non-final form documents is not acceptable. We need to be able to follow references in this document back to the planning documents that are supposedly referred to even if these documents are in draft form and, here again, another ongoing problem is being able to see documents in their draft form. I'll tell you if it says draft on the front if it, I know what that means. It means it's not completed, that not everything in there is finalized, but at least it gives you an idea of what's going on. As we found with the Department of Energy, it can take years, sometimes many years, to get some documents from their draft form to their final form and it seems like some of them never, ever get finalized. The point is, is if we don't have them in draft form, then they should not be referenced. If we don't have them available in draft form, they should not be referenced. The plan itself, this document on the 903 Pad Area, should actually include the information they want referenced right in it if that is the case.

Response to Comment 59

Please refer to Response to Comment 30.

2.2 WRITTEN COMMENTS RECEIVED DURING PUBLIC COMMENT PERIOD

WRITTEN COMMENTS: ENVIRONMENTAL PROTECTION AGENCY

Comment 60

In commenting on the draft plan, EPA stated that alternatives to disposal of treated water in surface drainages "must be evaluated as part of an overall strategy to reduce or eliminate potentially contaminated inflows" to downstream reservoirs. In response, DOE refused to consider such options, contending this was "not part of an interim action approach" and that such options could adversely affect individual water rights" on Walnut and Woman Creeks.

First, attempts to eliminate potentially contaminated offsite discharges are most certainly an integral part of an "interim action approach" as defined by EPA, and should be part of this one. Second, interested parties have aggressively advocated elimination of all RFP releases to offsite waters; DOE has acquiesced to this long-term goal, and made larger discharge reductions without water-rights problems. Thus it appears the specific arguments advanced are groundless and the refusal to evaluate disposal options actually results from a desire to avoid the complications of coordinating with other DOE/EG&G management entities. EPA submits that greater complications could result from disregarding "zero-discharge" options in defiance of the extremely strong public position on this issue. Also, DOE should not discharge without prior analysis as this may raise questions of compliance with CDH stream standards, the ARARs pertinent to this action.

Response to Comment 60

Please see Response to Comment 33.

Comment 61

Dust resuspension/safety issues including the possible use of temporary enclosures for invasive activities have been raised by numerous parties as a major concern in relation to OU2. The radiological survey underway in this area must provide information relative to the 2 dpm/gm CDH soil standard, the control measures incorporated in the SOPs must be applied, and the PPCD procedures must be used to evaluate risks from atmospheric dispersion. This will provide the required technical justification for responsible decisions on the need for additional control measures.

Response to Comment 61

The issue of dust entrainment is discussed in Response to Comments 8 and 13.

Comment 62

RCRA Subpart F groundwater protection standard (264.94) must be interpreted as a relevant and appropriate requirement in this instance, since the contamination is directly linked to seeps and since the sources of the contamination are SWMUs from a RCRA regulated facility. The RCRA groundwater protection standard, as with all other ARARs, must be attained. It is true that the interim measure must attain ARARs to the extent practicable, considering the exigency of the interim response, but this is not the same as not being required to attain ARARs. However, the argument of whether they are ARAR

or TBC misses the point. Regardless of the label applied, the NCP requirements pertaining to acceptable risk (which are consistent with the RCRA ACL concept) must be incorporated in this decision document. DOE must recognize that compliance with ARARs is not the whole issue; protectiveness criteria [40 CFR 430(e)(2)(i)(A)(2)] must still be met, even if it requires further reduction of specific standards for some contaminants.

Response to Comment 62

We do not disagree that RCRA Subpart F requirements are relevant and appropriate only that achieving background concentrations for Appendix VIII constituents may be unduly restrictive. EPA policy (CERCLA Compliance with Other Laws Manual) is that Superfund remedial actions meet RCRA Subpart F requirements by establishing a remediation level that is equivalent of a health-based ACL. However, the NCP protectiveness criteria will be met, recognizing that adjustments in ARARs may be necessary. EPA and CDH will determine if a waiver from an ARAR due to the exigencies of the interim response is justified.

Comment 63

The statements made to explain the exclusion of methylene chloride, vinyl chloride, and acetone from consideration in treatment plant design are still not convincing. On the surface, the lack of these constituents in samples taken recently (presumably under better QA procedures) at the now current location of SW-61 would seem to support this assumption. However, this neglects several pertinent questions: Was it really there once, and might it reappear under changing environmental conditions? Since the "old" SW-61 is no longer sampled, how do we know these contaminants are not still there and are simply being stripped off and diluted by stream action before reaching the "new" SW-61? If this is the case, wouldn't collection at the point of exit from the culvert make more sense?

The possibility that additional organic constituents may exist (or appear during the six years this system will operate) in the seeps seems reasonable, perhaps likely. The obstinate refusal to acknowledge such a possibility could be costly in time, money, and credibility. Simple prudence dictates at least preparation of a contingency plan which could be activated to address this situation, should it occur.

Response to Comment 63

Please see Response to Comment 92.

Comment 64

Costs shown for various portions of the alternatives, including labor, non-construction, and materials appear excessive as compared to standard construction cost references. Unit cost sources and adjustments made to allow for RFP conditions and requirements should be identified as such. Even though these costs are rough and are only used here for comparison purposes, inflating them unrealistically serves no legitimate purpose.

Response to Comment 64

Conservative estimating practices were adhered to in conduct of the surface water collection and treatment alternative cost estimates. Unnecessary cost inflation or padding has not been built into the costs; however, conservative cost estimating practice requires that the upper range of material and service costs be used.

Comment 65

There is no discussion regarding how the remedies considered comply with location-specific and action-specific ARARs. Whether those remedies will attain chemical-specific ARARs, or whether those remedies will ensure protectiveness. The document must integrate these factors into the decision making process. As it stands now, there is no clear relationship between the ARAR discussion and the selection of the proposed remedy.

Response to Comment 65

All alternatives considered in the IM/IRA Plan will meet location and action-specific ARARs. The text in Section 3 will be revised to make this explicit. The discussions in Section 4 (effectiveness sections) and the summary in Section 5 highlight the chemical-specific ARARs that may not be achieved for various technical reasons. Section 5 clearly highlights the technical and economic factors that support selection of the preferred alternative.

Comment 66

LDR as an ARAR should be addressed both for establishing cleanup standards and for identifying disposal/treatment options for the treatment residues.

Response to Comment 66

The text will be modified to more clearly explain the applicability of the LDRs to placement of restricted wastes, be it effluent from the treatment plant or secondary waste.

Comment 67

The document must commit to meeting all ARARs and cleanup standards. In the event that at some point in the future an ARAR waiver becomes necessary, the decision document may need to be revisited at that time.

Response to Comment 67

DOE is committed to protecting the public health and environment. EPA and CDH will determine if an ARAR waiver is justified. Please see our response to Comments 28 and 62.

Comment 68

Section 2.5. It should be noted that the current NPDES permit does not regulate the contaminants to be addressed through the IM/IRA. The review of this permit now underway may or may not expand the list of regulated compounds, so NPDES compliance does not correlate directly with adequate protectiveness in this particular instance.

Response to Comment 68

Please see Response to Comment 5.

Comment 69

Section 3.3. In list item three, note that 10^{-6} is the point of departure for cancer risk assessments.

Response to Comment 69

The 10^{-6} point of departure for cancer risk assessments has been noted in the revised text.

Comment 70

Section 3.3. The explanation of "Applicable Standards" should be replaced with the definition of "Applicable Requirements" as found in the NCP. Similarly, the definition of "Relevant and Appropriate" can be extracted from the NCP and included here; the discussion of TBCs (which should include DOE, CDH, and EPA policies) on the following page should also be moved here to complete this discussion.

Response to Comment 70

Your suggestions have been incorporated in the final Plan.

Comment 71

Section 3.3.1. It is not clear why the TDS standard is considered ARAR for all the constituents listed except strontium, or why strontium should not use background as ARAR rather than TBC since this is the normal procedure in the absence of a risk-based ACL. Please explain.

Response to Comment 71

Strontium is a minor element contributing to TDS. Strontium is not a RCRA hazardous constituent and therefore Subpart F regulations and the concept of ACLs are not applicable.

Comment 72

Section 3.3.1. The ARARs listed here are still only listed as potential. As noted in our comments on the previous draft, DOE must identify what it believes to be ARAR and submit that determination for review; this is a yes or no question, potential does not apply.

Response to Comment 72

This is our oversight. The word "potentially" will be removed from the text in Sections 3.3.1.1, 3.3.1.2, and 3.3.1.3. DOE has proposed the ARARs identified in the IM/IRA Plan. Approval of the plan will establish the ARARs for the IM/IRA.

Comment 73

Section 3.3.2. This discussion of Locational Requirements needs to be flushed out in much greater detail, listed out in Table D, and integrated into the remedy selection process.

Response to Comment 73

All alternatives developed for the IM/IRA Plan meet the location-specific ARARs. This will be noted in the text, and greater detail will be provided on these ARARs.

Comment 74

Section 3.3.3. It is not clear what conclusion is reached on Action-Specific requirements.

Response to Comment 74

The text will be modified to note that all alternatives evaluated in the IM/IRA Plan will meet action-specific ARARs.

Comment 75

Section 4.1.1. This section should indicate that agreement was reached on which seeps would be proposed for collection in the document released for public comment. No decision can be made until such comment is properly obtained and responded to. Similarly, the collection methods are proposed for comment, including the decision to exclude SW103 (perhaps only until a later date).

Response to Comment 75

We feel the text of Section 4.1.1 need not be revised because this comment is applicable to all facets of the entire plan. Release of the document for public comment, responding to public comments, and finalizing the plan in light of the public comments is the process by which the public has input to the planning of this IM/IRA. For example, based on public comment, there will no longer be any interbasin transfer of contaminated water as originally proposed in the IM/IRA Plan.

Comment 76

Section 4.2. The primary document establishing requirements for the alternative evaluation process is the NCP, which should be referenced here as such.

Response to Comment 76

Section 4.2 has been revised to state that the IM/IRA alternative evaluation process is based on EPA guidance set forth in the March 1990 NCP.

Comment 77

Section 4.3.1.1. From the description given, it is very difficult to visualize the configuration of SW-64 and the proposed sump location. Collection should be at the source, or an explanation of why the flow cannot be collected there is required. Section 6.1.1 must be revised accordingly if the collection system is changed.

Response to Comment 77

Please see the discussion in the Executive Summary regarding the deferment of collection of SW-64 and the other Woman Creek drainage seeps.

Comment 78

Section 4.4.2.1. The discussion presented indicates that very little is really known about plutonium behavior in solution or the effect of membrane filtration on it. Statements such as "it is presumed" and "it would appear that" do not inspire confidence in this treatment method, especially when apparently backed only by conjecture on basic information such as the ionic/anionic state(s) of plutonium at different pH levels. These questions should focus current research and testing; new information obtained should be incorporated in the final document.

Response to Comment 78

Removal of plutonium (and americium) from natural water systems is a new frontier, and field treatability testing on the South Walnut Creek water is being implemented to gain knowledge and to examine the performance of cross-flow membrane filtration and other applicable technologies, if warranted. Furthermore, bench-scale testing on the radionuclide contaminated waters of the 903 Pad Area seeps will be conducted to gain more knowledge prior to selecting a treatment technology for these seeps. Please see our discussion of this matter in the Executive Summary of this Responsiveness Summary.

Comment 79

Section 6.1.1. The diversion weir is to divert all flows up to 38 gpm to the collection sump; since this establishes the maximum inflow rate, there is no reason (except equipment failure) for inflow to exceed pumping rate and no need to dump overflow back in the screen. Please explain and/or illustrate the system configuration more clearly to eliminate this confusion.

Response to Comment 79

Failure of the system transferring liquid from the CS-61 sump to the treatment system equalization tank may result in collected water in excess of sump capacity to be directed back into the drainage. The text in Section 6.1 will be revised to note the reason for an overflow condition.

Comment 80

Appendix E. Location specific ARARs, including those for wetlands protection, must be listed and addressed in the same fashion as for other entries here.

Response to Comment 80

Appendix E will include tabulation of location-specific ARARs as is now provided for action-specific ARARs.

Comment 81

Appendix E. Citations to DOE policies and standards must be classified as "TBC" unless they are promulgated and enforceable requirements.

Response to Comment 81

We agree. Revisions will be made as appropriate.

WRITTEN COMMENTS: COLORADO DEPARTMENT OF HEALTH

Comment 82

Section 2.2.3.2. In the fourth paragraph of this section, there is reference to a hydraulic gradient of 0.02 feet/feet. The proper units to this are foot/foot.

Response to Comment 82

In the literature, hydraulic gradient is expressed in units of length/length or as a dimensionless quantity. Units of foot/foot and feet/feet are both considered acceptable.

Comment 83

Section 2.2.3.2, Figure 2-7. As this map is contoured, there are several places where the potentiometric surface is above the topographic surface. Some of these places are on or near known surface seeps and it is reasonable to expect that the potentiometric surface would be equivalent to, but not higher than (as shown currently on the map) the ground surface at these locations. There are also several other places on the map where a similar phenomenon is indicated where seeps have not been found. The reverse is also true. Several of the known surface seeps are shown with the potentiometric surface well below their topographic elevation. Please review this figure and correct the contours accordingly (see attached copy of Figure 2-7 for examples of the above).

Response to Comment 83

Figure 2-7 will be revised to correct the discrepancies between the topographic and potentiometric contour lines.

Comment 84

Section 2.2.3.2, Bedrock Ground Water. Omit the word "flow" from the first sentence of the first paragraph. True ground water flow in the lenticular Arapahoe Formation sandstones has not been completely characterized and may turn out to be a misnomer. Later, in the third and fourth sentences of the same paragraph, reference is made to usable ground water in the Arapahoe aquifer east of RFP. Add some additional text explaining more precisely where geographically and where stratigraphically within the Arapahoe this water is produced.

In the third paragraph, there is reference again to "flow" in the sands being regionally west to east. If this statement is based on the regional gradient only, then a statement to that effect is necessary. If it is based on other data, then show the data.

Response to Comment 84

The first paragraph in Section 2.2.3.2, Bedrock Ground Water, has been revised as follows:

The greatest potential for ground-water flow in the Arapahoe Formation occurs in the meandering lenticular sandstones contained within the claystones (i.e., the basal formation) due to their relatively higher permeability. Flow within individual sandstones is assumed to be from west to east, but the geometry of the bedrock ground-water flow path is not fully understood at this time due to its dependence upon the continuity of the sandstones and their hydraulic interconnection (Robson, 1981). Ground-water recharge to sandstones occurs as infiltration from alluvial ground water where sandstones subcrop beneath the alluvium and by leakage

from claystones overlying the sandstones. Ground-water from the basal formation of the Arapahoe aquifer is used for irrigation, livestock, watering, and domestic purposes. Wells are located east of the RFP within the Denver Basin. Source: Robson, S. G., J. C. Romero, and S. W. Zawistowski, 1981. Geologic Structure, Hydrology, and Water Quality of the Arapahoe Aquifer in the Denver Basin, Colorado: U.S. Geological Survey Atlas HA-647.

Comment 85

Section 2.3.2. Omit "on a routine basis" from the first sentence of the introductory paragraph. This phrase implies more than RFP can deliver in terms of past sampling regularity and frequency.

Response to Comment 85

The phrase "on a routine basis" will be removed from the text.

Comment 86

Section 2.3.2.1. These figures show contours of various contaminant plumes but show no data posted next to wells. As presented, a user or reader of this document has to cross-reference these figures with the appropriate appendix which is a laborious and time consuming process. Post the data used to construct the contours next to the appropriate wells.

Response to Comment 86

The ground-water data in Table A-5, Appendix A, for carbon tetrachloride, tetrachloroethene, and trichloroethene will be added to Figures 2-8, 2-9, and 2-10, respectively.

Comment 87

Section 2.3.3. Within the text, wherever there is reference to a surface water, ground water, or sediment sample there is a map that accompanies the discussion that shows where the samples were taken. This section needs a map similar to the others that locates the soil samples so that the reader can locate the soil sample data geographically.

Response to Comment 87

The soil stations listed in Tables A-10 and A-11, Appendix A, will be placed on an OU 2 base map and included in Section 2.3.3. Due to the large number of soil stations, 72 total, closely spaced stations may be grouped together rather than showing each individual station in order to maintain map clarity.

Comment 88

Section 2.5. This section does a poor job of convincing the public that this IM/IRA is justified. Please add text to explain that:

1. *Even though the present threat to health and the environment is not immediate, without implementation of this IM/IRA a significant imminent threat could result.*

2. *If left unchecked, this contamination has a much greater chance of leaving the RFP plantsite even though presently all water is treated before leaving plantsite.*

3. *Implementation of this IM/IRA will enhance RFP's efforts to prevent the uncontrolled release of contaminated water.*

4. *By limiting contaminant spreading and, therefore, affected areas, this IM/IRA will save large amounts of future expenditures because future cleanup projects will be smaller.*

Response to Comment 88

Section 2.5 will be modified to better justify the need for the IM/IRA. Each of your suggestions will be considered in the modification.

Comment 89

Section 3.1. The first sentence of this section should describe the collected surface water as contaminated surface water.

Response to Comment 89

The adjective "contaminated" will be added to the text as suggested.

Comment 90

Section 4.3.1.1. A discussion as to why the proposed design is limited to only "base flow" is necessary so that misconceptions on the purpose and scope of this IM/IRA can be avoided.

Response to Comment 90

Please see Response to Comment 136.

Comment 91

Section 4.3.1. In the draft version of this document, there were two figures (Figures 4-3 and 4-4) that were very instructive. There is no reason given in the response to comments as to why these were removed. These figures were helpful in visualizing all the verbiage in the text as to how these various collections will be physically constructed and should be included in the final version.

Response to Comment 91

Figures 4-3 and 4-4 in the 12 June 1990 draft Plan presented design details of the Surface Water IM/IRA collection systems that are more appropriately addressed in the design phase of this project. The engineering scope of the Surface Water IM/IRA Plan is limited to the concept level. The figures were, therefore, removed from the Plan.

Comment 92

Section 4.4.3.1. In the "Effectiveness" paragraph, vinyl chloride, methylene chloride, and acetone are mentioned as 1) being below detection limits at SW-61, and 2) not readily adsorbed by GAC. Several questions arise and some clarification in the text is necessary. First, all three of these constituents were detected in various locations in the surface water sample locations in Upper South Walnut Creek. What happens to these chemicals between where they were seen and SW-61? Are they diluted to the non-detection limit, volatilized, or what? Second, since these three are found, and since GAC does a poor job of stripping them from the collected water, what will happen to them?

Response to Comment 92

Vinyl chloride, methylene chloride, and acetone have been detected in samples from the upper reach of South Walnut Creek, and sometimes in associated blanks. Their absence at SW-61 may be due to lab artifact (not actually present at the upstream stations), dilution, or volatilization. In the unlikely event these compounds appear at SW-61, and GAC is not shown to provide adequate treatment during the field treatability study phase of the project, alternative technologies will be tested and utilized as appropriate. The text of the IM/IRA Plan has been revised accordingly.

Comment 93

Section 4.4.3.1. See Comment 11 (Comment 92 in the Responsiveness Summary) as it applies to the "Costs" paragraph.

Response to Comment 93

If the results of the field treatability study show that liquid-phase GAC does not provide adequate remediation of OU 2 surface water, the alternative technologies examined will be costed (if not already) for purposes of evaluating relative costs.

Comment 94

Section 6.1.1. In the last sentence of the second paragraph, the text says that "the excess flow will return through overflow piping to the drainage way below the weir." Please clarify "way below."

Response to Comment 94

The misunderstanding results from an incorrect use of the word "way. "The sentence has been revised as follows: "The excess flow will return through overflow piping to the drainage below the weir."

Comment 95

Section 6.3. Please attach a schedule of deadlines for these documents.

Response to Comment 95

Section 6.3 will be modified to include scheduled completion dates for the additional project plans and documents cited.

Comment 96

Section 7.10. The last paragraph of this section needs clarification, particularly regarding discharges from pond B-5. Discussion concerning the need for the discharges, pond B-5 capacity, and why releases will not impact Walnut Creek downstream is necessary.

Response to Comment 96

The paragraph has been modified in light of our proposal to not transfer Woman Creek seepage to the South Walnut Creek drainage. See discussion in the Executive Summary.

Comment 97

In the executive summary, the first paragraph would give the casual reader the impression that this IM/IRA is being done only because EPA and CDH want it done. By omitting the sentence "EPA and CDH consider an interim remedial action for surface water to be a high priority," this incorrect impression would be avoided.

Response to Comment 97

The intent of the wording in the first paragraph concerning EPA and CDH considering this to be a high priority was based upon the reprioritization of the operable units in the latest draft IAG. Nevertheless, we will delete this sentence as requested.

Comment 98

Appendix E. All of the seeps that are part of this IM/IRA as well as the treatment discharge point become part of "Segment 5" of the South Platte Drainage Basin after collection and treatment. Therefore, the standards proposed for Walnut Creek by the Colorado Water Quality Control Commission should be the ARARs. A list of the constituents and their applicable and relevant standards (ARARs) follow for parameters that need to be changed or added:

Constituent	*ARAR µg/l*	*Reference*
Aluminum	*150*	*CDH Aquatic Life*
Cadmium	*2.3*	*CDH Aquatic Life*
Nickel	*18.5*	*RCRA Subpart F*

Response to Comment 98

We agree that the in-stream standards for Walnut Creek are ARAR. We note that the Water Quality Control Commission surface water quality standards for Segment 4 of Woman Creek and Walnut Creek (downstream of Pond C-2 and B-5, respectively) are designated as goals for Segment 5 (Pond C-2 and upper reaches of North and South Walnut Creek). Although the CDH surface water quality standards for Woman Creek and Walnut Creek are only goals in the reaches adjacent to Operable Unit No. 2, they are considered relevant and appropriate because the lower reaches must attain these standards, and therefore cannot be impacted by releases from Operable Unit No. 2.

We stand corrected, the most stringent aluminum ARAR is the in-stream Walnut Creek standard for the protection of aquatic life. The in-stream cadmium standard must be computed by formula imputing a hardness value based on the lower 95 percent confidence limit of the mean hardness value at the periodic low flow

criteria, as determined from regression analysis of site-specific data. Insufficient data exists to perform this computation. Nevertheless, we again stand corrected in that the Ambient Water Quality Criterion of 0.001 mg/ℓ is most stringent, and therefore, the ARAR defaults to the detection limit of 0.005U.

Comment 99

Appendix E. Based upon the list of EPA Methods, detection limits associated with the following constituents are lower than those listed in the IM/IRA document:

Constituent	*EPA Method*	*Detection Limit*
Trichloroethene	*502.2*	*1.0 ppb (µg/ℓ)*
Tetrachloroethene	*502.2*	*1.0 ppb (µg/ℓ)*
1,1-Dichloroethane	*502.2*	*1.0 ppb (µg/ℓ)*
1,2-Dichloroethene	*502.2*	*1.0 ppb (µg/ℓ)*
Carbon Tetrachloride	*502.2*	*1.0 ppb (µg/ℓ)*
Methylene Chloride	*502.2*	*1.0 ppb (µg/ℓ)*
Vinyl Chloride	*502.2*	*1.0 ppb (µg/ℓ)*

Of these, only Tetrachloroethene and Vinyl Chloride have a standard associated with them that is lower than the ARAR in the IM/IRA and closer to the above listed detection limit. Please correct the detection limits for these constituents and change the ARAR of Tetrachloroethene and Vinyl Chloride to 1.0 µg/ℓ and 2.0 µg/ℓ, respectively.

Response to Comment 99

The gas chromatography method noted will be used for analysis of vinyl chloride and tetrachloroethene. The ARARs and detection limits will be changed accordingly in the revised document.

Comment 100

Because the impending Water Management Plan is such an important document in addressing water quality at RFP, some cross-references at proper points throughout this document would be nice. Tying the two programs together is not required (since the WMP is not part of the IAG) but would be very helpful, particularly in discussing ARARs, background vs. baseline contaminate levels, site-wide treatment performance standards, and continuing monitoring plans.

Response to Comment 100

The Water Management Plan will be reviewed in relation to the Surface Water IM/IRA and cross-referenced in the Plan where appropriate.

WRITTEN COMMENTS: **Paula Elofson-Gardine**
Director, Concerned Health Technicians for a Cleaner Colorado
Director, Rocky Flats Cleanup Commission
Member, Rocky Flats Alliance

Comment 101

The executive summary of this report implies that the water meets NPDES permit requirements, so is no threat to the public. The NPDES permit requirements currently do not include radionuclides, and the new NPDES permit is not out yet. As radioactive constituents of the water flowing in and through the Rocky Flats Plant is a prime concern to many, the contention that this is no threat to the public is not necessarily justified.

Response to Comment 101

Please see Response to Comment 5.

Comment 102

It appears that field and laboratory studies have not been done to confirm isotopic identity of the seeps, dissolved fractions, particle sizes, and/or solubility or nature of insolubles in this area. The radioactive removal unit assumes ionic radioactive species. This is not an appropriate assumption. I would cite the following reports:

RFP 2901	*Soil Decontamination at Rocky Flats*
RFP 3914	*Dust Transport-Wind Blown and Mechanical Resuspension*
RFP 3130	*Decontamination of Soil Containing Plutonium & Americium*
RFP 3226	*Removal of Plutonium Contaminated Soil From the 903 Lip Area During 1976 and 1978*

These reports indicate that greater than 50% of the contamination at the 903 area is suspected to be in the less than 0.01 micron size range, whether colloidal and/or insoluble particles. If this study states that it is unable to quantify colloidal materials between the 0.1 to 0.45 micron size range, it is a significant failing considering the earlier studies. (Especially considering the sizes are orders of magnitude different, etc.). It is important to identify solubles versus insolubles. If much of the contamination is soluble, it may be amenable to precipitation and flocculation. But if much of the contamination is in the insoluble form, and less than 0.01 microns in size, just how do you propose to deal with these extremely fine particles?

Response to Comment 102

Please see Response to Comment 6.

Comment 103

The REVERSE OSMOSIS (R-O) PILOT PLANT has not been listed as an alternative water treatment. Why not? This could save much effort and money, along with possibly being able to remove the more minute particles from the seeps.

Response to Comment 103

Please see Response to Comment 47.

Comment 104

Table 4-1 lists dissolved gross alpha radiation at 17.70 pCi/l versus 632.0 pCi/l of total gross alpha radiation. Is this difference indicative of dissolved fractions versus insoluble fractions and/or colloidal particulates? There has been significant discussion amongst several physicists on oversight panels regarding the chemical forms of plutonium at the 903 area. Has the plutonium in soils and in seeps been identified to be ionic (e.g., $PuCl_4$, $PuNO_3$, etc.), or complexed with volatile organics in the elemental state? Some of the discussions centered around concerns regarding volatile and explosive characteristics. Please elaborate upon these discussions/information.

Response to Comment 104

Please see Response to Comment 12.

An explosive hazard is not present due to the very low concentrations of VOCs in OU 2 surface water.

Comment 105

A complete isotopic characterization and identification has not been done. Since Coors reportedly dumped 238-Pu, 235-U, and other Project Pluto wastes at the 903 area, they should be participating as a co-Respondent and Potentially Responsible Party in the assessment and clean-up costs of this area. The failure to completely identify and quantify all radioactive isotopes in this area is a significant deficit, as this could aid in determining relative risk to workers and to the public represented by the spread and environmental migration of these contaminants due to any disturbance of this area. Dr. Whicker from CSU is currently studying the soils and isotopes in this area. Please provide this report for review (and/or progress reports).

Response to Comment 105

Please see Response to Comment 6 for a discussion of isotopic characterization. Please see response to Comment 37 concerning the relevance of PRP identification to the IM/IRA.

Comment 106

There is a lack of hydrogeology and plume dispersion information. This could hamper appropriate interception attempts. For example: sandstone lenses have been notated in the past to be of questionable integrity, with some technicians questioning migration between the alluvia. There are further questions regarding the swiss-cheese approach to ground-water monitoring. Do you know the extent of any alluvia cross-contamination caused by drilling and disturbance of this area? Do you know with any degree of certainty whether or not the radioactive seepage from the 903 Pad area is originating from underground springs and/or groundwater running through the pad? The averaging of flow rates and contaminants is disturbing, as it obscures highs and lows. Please correct this. It is unfortunate that this plan does not address leaching of water through the 903 Pad.

Response to Comment 106

Precautions are taken during installation of monitoring wells to prevent alluvial and bedrock cross-contamination. These precautions are built into the SOPs for installation of wells. Examples include use of steam-cleaned augers for each zone of contamination, installation of surface casings prior to drilling into bedrock, containment and recovery of drill cuttings, etc.

The 903 Pad and Lip Area seeps are a result of shallow impermeable layers that direct ground water to the surface.

The averaging calculations discussed in Section 4.1.2 and presented in Appendix E are for the purpose of establishing the design basis for the treatment system (see Table 4-1, Influent Concentrations). The calculations present worst case (i.e., flow weighted maximum concentrations) and expected steady state (i.e., flow weighted average concentrations) scenarios. The calculations are not intended to present data extremes although maximum concentrations are tabulated in Appendix E computer worksheet.

Please see Response to Comment 6 for a discussion of leachate from soils.

Comment 107

Plutonium transport by wind is notated as a significant and primary source of contaminant spread, but plutonium, americium, uranium, beryllium (plus any other dry contaminant) dust resuspension hazard is not addressed for safety measures for workers with respect to remediation efforts. We have serious concerns regarding encroachment on the 881 Hillside area from these radioactive and/or chemical seeps, leachate, and resuspension. The workers currently working on remediation efforts at the 881 area need to have the appropriate respiratory protection, especially in consideration of the radioactive dust resuspension problem. Inhalation of alpha particles is extremely hazardous. We would also remind you of our many requests for a containment building around remediation areas to control spread of contaminants during earth moving and other activities that will disturb these most contaminated areas of the plant site.

Response to Comment 107

Please refer to Response to Comment 8.

Comment 108

Section 2.3.6, Air Contamination: There are several discrepancies noted. Ambient air concentration is stated to be approximately at or within 20.0 x 10^{-6} pCi/l. Do you mean pCi/m^3? You have used an aqueous quantity measure where an air quantity measure should have been used. This has been noted elsewhere in the report, where mg was used instead of pCi, etc. Please correct this and proofread this document for similar errors. The Gerhardt Langer resuspension report indicated much greater levels of airborne contaminants such as plutonium and americium. The DOE's Environmental Measurements Lab in New York historically has shown values of airborne contaminants in this area that has been orders of magnitude greater than the numbers cited within this report. Please explain these discrepancies in reporting. Perhaps it would be helpful to adopt Dr. Langer's method of coating the back of the monitor with a thin film of oil to capture these minute particles that you seem to be missing. There is also concern that the RFP is "over-correcting" for background radiation.

Response to Comment 108

Please see Response to Comment 10.

Comment 109

The physical description of the proposed water treatment equipment raises several issues. I would cite the following reports:

DP-MS-87-14 Irradiation Effects in Metals
DPE-3586 Radiation Effects on Nonmetallic Materials and Components
Draft Treatability Studies Plan, EG&G Rocky Flats Environmental Restoration Program, 9/21/90

It appears that you are planning to utilize materials that could be subject to degradation by the chemicals and radionuclides that are supposed to be filtered or treated in these seeps. The samplings cited in the draft treatability studies plan are not consistent with the levels reported in the IM/IRA document for the same area. Please explain this discrepancy.

Response to Comment 109

Many of the contaminant compounds present in the surface water are known to be incompatible with common construction materials (e.g., VOCs and PVC). However, the contaminant concentrations are low enough that material compatibility is not an engineering issue.

The OU 2 surface water quality data set referenced in the draft Site-wide Treatability Studies Plan dated 21 September 1990 includes data mostly obtained in 1986 and 1987 and available in published reports. The Surface Water IM/IRA Plan, however, includes all data available through mid 1990.

Comment 110

We would like to suggest that in the future, you allow at least a 6-week lead time from release of document to the public comment hearing to be held for the document in question. We would be happy to assist in the distribution of the documents to expedite this process for interested parties. We would appreciate receiving a copy of the transcript of the proceedings held 10/23/90. Thank you.

Response to Comment 110

Please refer to Response to Comment 21. Transcripts of the public comment meeting were sent to all who offered comment and to all other participants who requested them as they signed in at the meeting.

WRITTEN COMMENTS: **Joseph Goldfield**
Engineering Consultant

Comment 111

The 903 Pad and Lip Area, Mound, and East Trenches Areas have been designated Operable Unit No. 2 (hereinafter referred to as OU 2). OU 2 is very heavily contaminated with a large number of volatile organic compounds (VOC), metals, inorganic materials, radionuclides, and semi-volatile organic compounds. It is difficult to make a complete count of the numerous contaminants of significance. There are at least 15 VOC, 20 metals, 5 inorganic materials, 7 radionuclides, and 4 semi-volatile organic materials found in the soils or drainage system from (waters and sediments) OU 2. The over 50 contaminants represent different levels of hazard to the community because of varying toxicity, concentration, and degree of mobility into the air and waters moving into the soil, water and air leaving the Rocky Flats Plant area. Nevertheless, the toxicity of some of the contaminants, particularly plutonium and americium, is of great concern. Almost all the materials cited are present in concentrations above the background level. Many have caused concentrations above the Applicable or Relevant and Appropriate Requirements (ARARs) to be found in the surface waters draining from OU 2.

The degree of contamination in the soils of OU 2 is not accurately known due to the hazards of collecting samples. One of the most poignant but significant descriptions pertaining to that problem appears in Volume 1, page 3-29. . . "Boreholes were not drilled into sites still containing wastes (the trenches and 903 Pad) due to potential hazards to field workers and potential for release of waste constituents to the environment."

In soils east of OU 2 americium has been found at levels of 97 pCi/g (picocuries per gram of soil), annunciating by inference the presence of plutonium at levels of 500 pCi/g of soil. That level for plutonium found in the soil is 500 times as high as the Colorado Department of Health limit of 1 pCi/g. Since the background concentration of plutonium in soil is 0.08 dpm/g (disintegrations per minute per gram of soil) and 2.2 dpm is equal to 1 pCi, the concentration of plutonium found east of OU 2 is **14,000 times as high as background**.

The contamination present in the soils of OU 2 is slowly but inexorably moving east into the communities near the Rocky Flats Plant, propelled by the wind, groundwater, and surface water runoff.

The proposal in the subject action plan is to clean up the contamination in the surface water runoff from OU 2.

Several issues are raised in these comments - some of which were also raised in comments made concerning the 881 Hillside Cleanup. A copy of those comments are attached to these because the issues are almost identical.

The three issues raised in the 881 Hillside Cleanup comments are almost identical to those applicable to OU 2 are:

1. *Workers participating in excavation and drilling must be adequately protected from breathing air carrying contaminated soil particles and from carrying that contamination home to their families on their clothing.*

2. *The people in areas surrounding Rocky Flats must be adequately protected from the suspension of contaminated soil particles.*

3. *The planned treatment of the contaminated ground water must consider the presence of over 50 hazardous contaminants present in the soil and water runoff.*

In addition, a fourth issue is addressed herein. Why is only the ground water being treated? Why not simultaneously excavate and remove the grossly contaminated, buried wastes in OU 2 that are serving as a focal point source of the contamination finding its way into the water drainage system that moves towards drinking water supplies and to the soils of surrounding communities?

Response to Comment 111

Please refer to Response to Comments 8 and 13 pertaining to worker and public health and safety concerning resuspension of contaminated dust, and refer to the Executive Summary regarding predicted worker and public health risks from such dust resuspension (if uncontrolled). The IM/IRA considers treatment of contaminants present above ARAR in the surface water. The IM/IRA does not consider removal of buried waste sources because the sources require further characterization which will be performed during the Phase II RFI/RI starting in February 1991. Source control may also not provide "immediate" or complete remediation of contaminated surface water (the imminent hazard).

Comment 112

The elements of OU 2 contain wastes buried by Rocky Flats that are among the more dangerous and heavily contaminated than those disclosed up to now. They are certainly more heavily contaminated than those disclosed in the 881 Hillside Cleanup proposal. The only certain, long-term solution to the problem of contaminated surface water run-off, ground water contamination, contamination of sediments in the water drainage system from the plant, and to the airborne soil particles blowing towards neighboring communities is to excavate, package and remove the wastes and associated soil. The treatment of water run-off and ground water can continue until the residual contamination that has already escaped from the buried waste falls to "safe" levels.

This proposed solution is so obvious, so certain of success, and so necessary as a long-term solution that it is difficult to see why it is not dealt with in the interim plan.

Response to Comment 112

The IM/IRA must deal with the identified imminent hazard, contaminated surface water, in a timely manner. Your suggested remedial alternative will certainly be considered in determining the final action for OU 2. Please also see Response to Comment 111.

Comment 113

The comments from the attached "881 Hillside Cleanup" are equally applicable to the construction work that must be done for the installations of the OU 2 cleanup. It is grossly unfair and possible criminal to have workers dig in the vicinity of soils that are as dangerous as those described above (quote from page 2-29). The workers and their families must be protected with breathing apparatus, throw-away clothing, change areas, showers, and all the other elements described in OSHA regulations attached to the report in the appendix.

Response to Comment 113

Please see Response to Comments 8 and 13.

Comment 114

In this area (OU 2), just as in the 881 Hillside, the most prevalent organic compound found in high concentrations is bis(2-Ethylhexyl) Phthalate. The ubiquitous occurrence of this material in grossly contaminated areas of Rocky Flats requires some explanation. The only guess I can make is that the material named is a synonym for di-octyl phthalate which is used for testing HEPA filters of which 14,000 are reputed to be in use at Rocky Flats. If it possible that the widespread finding of this chemical is marking the presence of large numbers of dangerously contaminated HEPA filters that are spent and are buried at the site?

Response to Comment 114

We have no reason to believe, based on historical information, that HEPA filters were disposed at the 881 Hillside Area.

Phthalates are ubiquitous in nature due to their use as plasticizers in common plastic products (i.e., gloves, bags, etc.). Collecting and handling environmental samples with plastic gloves, for example, may result in direct contamination of the samples with phthalates. Moreover, volatilization of phthlates from plastic products in the laboratory often results in cross-contamination of the samples in the laboratory.

Comment 115

The attached report for 881 Hillside Cleanup describes the concerns that are equally applicable to work done for the OU 2 Surface Water Cleanup. All excavation should be done within enclosures described therein that are equipped with exhaust systems to maintain the buildings under negative pressure.

Response to Comment 115

Again, please refer to Response to Comments 8 and 13 that address this issue.

Comment 116

The discussions of remedial action to be taken for removal of the multiple contaminants present in the surface water run-off from OU 2 does not take into account the fact that there are 50 contaminants present. The discussions dealing with removal of each contaminant propose to reduce that contaminant to less than its ARAR (Applicable or Relevant and Appropriate Requirements). That methodology is valid where only one contaminant is present in drinking water; **not where 50 dangerous contaminants are simultaneously present.**

Methods for dealing with this problem have long been known. One is described in the attached 881 Hillside Cleanup report that includes a method used by OSHA (Occupational Safety and Health Administration) for dealing with multiple contaminants in the workplace. A similar method is described in Chapter 1 -- Nuclear Regulatory Commission, Part 20, App. B, page 237, which states:

NOTE: In any case where there is a mixture in air or water of more than one radionuclide, the limiting values for purposes of this Appendix should be determined as follows:

If the identity and concentration of each radionuclide in the mixture are known, the limiting values should be derived as follows: Determine for each radionuclide in the mixture, the ratio between the quantity present in the mixture and the limit otherwise

established in Appendix B for the specific radionuclide when not in a mixture. **The sum of such ratios for all the radionuclides in the mixture may not exceed "1" (i.e., "unity").**

That rule is identical to the one used by OSHA.

Very similar rules are given in "Risk Assessment Guidance for Superfund, Volume 1, Human Health Evaluation Manual (Part A)" issued by the EPA.

The only method lacking is how to combine the various contaminants that are labelled "radionuclides," "carcinogens," and "non-carcinogens."

There is no justification for disregarding the presence of multiple contaminants. That methodology flies in the face of historical, regulatory practice; underestimates the degree of removal required for each contaminant; and poses greatly added risk to the population exposed to the treated water.

Some verbal comments have been made that the rule is not applicable to "interim-remedial actions." I don't understand that reasoning since the studies of life-time costing compare costs after 30 years of operation. If "interim" is supposed to embrace a very short-term solution, that is certainly not borne out by the 30-year estimate of equipment operation.

Response to Comment 116

The IM/IRA Plan does address the potential cumulative effects of carcinogens and non-carcinogens. In both cases, the effects are considered additive. Note in Section 3.3 items 2 and 3:

"The NCP [FR Vol 55, NO. 46, 8848; 40 CFR 300.430 (e)] requires that, in development of alternatives for final remediation, the following be considered: . . .

> for systemic contaminants, concentration levels that will not cause adverse effects to the human population and sensitive subgroups over a lifetime of exposure;
>
> for carcinogens, concentration levels that represent an excess lifetime individual cancer risk less than 10^{-4} considering multiple contaminants and multiple pathways of exposure..."

With respect to Item number 2 (non-carcinogenic risk), hazard quotients are computed and shown in Table E-1. Although not explicitly stated (text in Section 3.3.1.5 will be revised), the protectiveness goal for non-carcinogens is a hazard index of 1. The hazard index is the sum of the hazard quotients (i.e., the estimated daily intake (dose) to reference dose ratios) for all of the contaminants combined. In assessing non-carcinogenic risk, a hazard index of one or less is considered to be acceptable. If the hazard index exceeds one, it indicates that there might be the potential for adverse non-carcinogenic health effects occurring. Unlike the method used to evaluate the potential for carcinogenic toxicity, the hazard index does not indicate the probability of adverse health effects occurring, but is used as a benchmark for determining where there is a potential concern. The hazard index approach for evaluating non-carcinogenic risk was developed by the U.S. EPA.

Item number 3 is more explicit in addressing cumulative effects for carcinogens. It is assumed in assessing cumulative effects that the carcinogenic risk posed by individual contaminants is additive.

WRITTEN COMMENTS: CITY OF ARVADA

Comment 117

The City of Arvada appreciates the opportunity to comment on the Proposed Surface Water Interim Measures/Interim remedial Action (IM/IRA) Plan and Decision Document for OU-2. We provide our comments in hopes of having an impact on the future safe operations at the plant and on remediation of existing contamination. Below please find our comments.

Arvada is encouraged by the Department of Energy's (DOE) efforts to introduce interim measures to lessen or control existing environmental contamination at Rocky Flats until such time as full and final cleanup plans can be developed and implemented for contaminated areas. However, we are concerned that the interim measures have a positive effect in thwarting further contamination and that through their implementation, existing contamination is not exacerbated. For instance:

A. *It is imperative that all best management practices, to control the impact of construction activities and their effects on releasing further soil contamination, are put in place.*

B. *Strict compliance with dust suppression requirements must be implemented to help assure that contaminated soil is not spread further across both Rocky Flats and off site lands.*

C. *Pumper truck travel from areas within Women Creek to the treatment facility should be restricted when winds are at such a velocity that dust dispersion becomes a problem at the site.*

Response to Comment 117

Please see Response to Comments 8, 13, and 121 regarding plutonium contaminated dust and erosion control. There will be no interbasin transfer of contaminated water via tanker truck. See the Executive Summary for a discussion of this subject.

Comment 118

Given the fact that great expense and planning has gone into the construction of a separate treatment facility in the Women Creek drainage at the 881 Hillside, we are concerned with the decision to truck radionuclide contaminated Women Creek seep water to the Walnut Creek Basin for treatment. If Women Creek water was treated at Hillside 881, or the process waste system, the Walnut Creek system could be downsized and treatment of only those contaminants found in that basin would have to be treated there.

The added expense for treatment of Women Creek water, at the new facility, when it contributes approximately only 20% of the total volume, seems wasteful. Given the expense of equipping a treatment facility in Walnut Creek to treat radionuclides, of which non exist in Walnut Creek, it seems more logical to treat Women Creek contaminated seep water at a facility that is already equipped to treat radionuclides. Based on the volumes of Women Creek seep discharge, there should be no problem with the Hillside 881 or process waste systems treating those waters efficiently.

The City of Arvada is also concerned with the transfer of radionuclide contaminated water from one drainage basin to another. If treatment of the Women Creek water cannot meet standards for discharge into Walnut Creek, you should not be contaminating the Walnut Creek Basin with radionuclides which had not originated in that basin.

Response to Comment 118

The 881 Hillside treatment facility includes ion exchange for removal of metals and uranium. As discussed in Section 4.4.2.2 there is uncertainty as to the effectiveness of ion exchange to remove plutonium and americium (these are not contaminants of ground water at the 881 Hillside). However, additional studies will be conducted to evaluate ion exchange and other technologies before collection and treatment of the Woman Creek seeps with the intent of treating and discharging the water in the Woman Creek drainage. Please refer to our discussion of this matter in the Executive Summary.

Comment 119

The treatment facilities, designed to treat surface water contamination at OU-2, are designed to treat a maximum of 52 gallons per minute. This flow is based on historic average annual flows from the seeps in question for both drainage basins. Our concern is that, during high rain or snow periods, when water infiltrates the soil at higher rates and acts to flush the contamination through the seeps, the treatment facility is not designed to treat greater volumes of water.

Response to Comment 119

Please see our Response to Comment 136.

Comment 120

The City of Arvada has a concern with the capability of the proposed treatment facility meeting Applicable or Relevant and Appropriate Requirements (ARAR's) to the greatest extent possible. It is imperative that treatment facilities, capable of meeting all ARAR's are used in the Walnut Creek Basin. It is pointless to construct, at great expense, a facility which cannot treat water to a degree that it meets applicable standards. We question why water, which does not meet standards, should be treated by a system to a point where it still does not meet standards. We urge DOE to use proven technologies, which will meet all applicable standards, for discharge.

Response to Comment 120

Please see our responses to Comments 28 and 62.

WRITTEN COMMENTS: CITY OF WESTMINSTER

Comment 121

I am writing on behalf of the city of Westminster to provide comments on the Proposed Surface Water Interim Measures/Interim remedial Action Plan and Decision Document for the 903 Pad, Mound and East Trenches Area. The City of Westminster is very interested in the proposed plan because of the potential impact to the City's water supply, Standley Lake.

Standley Lake is located east of the Rocky Flats Plant and currently receives water from Woman Creek, which flows through the Rocky Flats Plant Site. Standley Lake also provides drinking water for the Cities of Thornton, Northglenn, and Federal Heights, as well as irrigation water for the Farmers Reservoir and Irrigation Company. The value of Standley Lake and the associated water rights as a source have a value in excess of $300 million and is essentially irreplaceable.

Westminster officials have reviewed the proposed plan and is pleased that this operable unit has been given a high priority because of the highly contaminated nature of this unit. However, because it is so contaminated, the cleanup of the site introduces new opportunities for the contamination to impact Standley Lake. For example, collecting the water in the sumps allows for the opportunity of a large amount of water to be released to the surface waters at one time during a storm event. Installation of the sumps and other features of the plan will result in exposure of contaminated soil, which can be transported by high winds or a large storm event. Therefore, while we believe this cleanup should proceed, it must go forward with the proper precautions in place.

Response to Comment 121

The IM/IRA collection system sumps are intended to collect only design surface water flows as discussed in Section 4 of the IM/IRA Plan. Storm water runoff will not be collected, but rather diverted around the sumps. The maximum volume of water stored by the IM/IRA system is limited by the capacities of the process tanks and the individual collection sumps. Dust abatement is discussed in Response to Comment 8.

The discussion of the surface water collection systems in Section 4 of the IM/IRA Plan will be augmented to include erosion control measures. Detailed design and specification of the IM/IRA collection systems will also include details of implementing erosion control measures during construction and operation of the IM/IRA.

Construction of the IM/IRA will proceed only after regulatory agency approval of the dust and erosion control measures to be used in the conduct of the project.

Comment 122

Westminster believes the most effective means of protecting Standley Lake is the interceptor canal system which has been developed through Congressman Skaggs' Option Review Group and has come to be known as Option B. The United States Department of Energy (DOE) has committed to funding a portion of that project during Fiscal Year 1991; however means of reimbursing the Cities for the project have not yet been worked out. In addition, the project is threatened with delay by DOE's apparent stance that a NEPA review of the project must take place. Westminster does not believe that NEPA applies to the initial stages of this project, because it is a City project which will go forward regardless of federal funding. If construction of the interceptor canal is delayed by an unnecessary NEPA review, it would not be in place by the time construction of the interim measure began. This scenario is not acceptable to Westminster. The interceptor canal must be in place prior to the initiation of construction of the interim measures because of the potential for contamination of the water supply.

Response to Comment 122

We disagree that the OU 2 Surface Water IM/IRA should be delayed until diversion structures around Standley Lake are in place. The DOE believes that prudent execution of the OU 2 Surface Water IM/IRA will assure the environmental integrity of areas downstream and downwind of the RFP. Improperly managed remedial actions have the potential to spread contaminants. The OU 2 IM/IRA, however, is being carefully planned in conjunction with the EPA and CDH to ensure an effective and safe action and to ensure that all necessary environmental monitoring will accompany remediation. The DOE is fully committed to execution of the OU 2 IM/IRA in a safe and reliable manner. Furthermore, we have deferred collection of 903 Pad Area seeps as discussed in the Executive Summary of this Responsiveness Summary.

Comment 123

The document fails to fully consider the potential impacts to water quality from the proposed plan. Impacts could occur from storm events transporting soil or contaminated water downstream, accidents involving the transport trucks, and many other incidents. The failure to fully consider these types of events and their impacts to the downstream water supply is inexcusable. When the potential impacts are considered, the only reasonable means to protect the water supply is construction of the interceptor canal prior to construction of this remedial measure.

As currently proposed, the plan calls for discharge of the effluent to Walnut Creek. Westminster would not allow discharge of the effluent to Woman Creek in the absence of the interceptor canal because there are no safeguards to insure that the effluent meets standards before it is discharged to the surface water stream. It is highly likely that water which still contains elevated levels of contaminants will not be leaving the treatment system at times, and Westminster will not accept discharge of such water into Woman Creek unless the interceptor canal is in place.

Response to Comment 123

Execution of the OU 2 IM/IRA in the absence of an interceptor canal around Standley Lake is discussed in Response to Comment 122.

The operation of a properly designed and automatically controlled treatment system is discussed in Response to Comment 17. Nevertheless, as discussed in the Executive Summary of this Responsiveness Summary, inter-basin transfer of water from Woman to Walnut Creek will not occur. Therefore, in the event of an unlikely treatment system failure, water discharged to South Walnut Creek will only be as contaminated as the existing drainage flow in the absence of the treatment plant.

Comment 124

The plan currently calls for transporting the water collected in the Woman Creek basin to the treatment facility by truck. This also presents a hazard to the water supply. In the event of an accident, the large amount of liquid being transported could spill at one time, increasing the likelihood that this water would reach and impact Standley Lake. This is further justification for having the interceptor canal in place prior to initiating this project. The plan also states that it may be difficult to access the collection sites during the Winter, but that this should not be a problem because flows from the seeps are usually low in the Winter. It would probably be difficult to access the site during the wet, Spring season also, unless the roads are improved. The Spring season is also a time of high flow, therefore, it is important to be able to access the sites at all times.

Response to Comment 124

Because of this concern and others, seeps will not be collected in the Woman Creek drainage until further studies are completed. Please refer to our discussion of this matter in the Executive Summary and in Response to Comment 122.

Comment 125

What preliminary testing has been done regarding the proposed treatment processes on the actual contaminated water? The Rocky Flats Plant has had problems in the past treating water from the ponds using "proven" technology which had worked in bench scale testing, but was ineffective in the field. The effectiveness of the proposed treatment methods should be confirmed prior to initiating construction.

Response to Comment 125

Please see our discussion of this matter in the Executive Summary.

Comment 126

The proposed treatment capacity of 50 gpm is not sufficient. Even the limited flow data which is available has shown flows greater than twice that flow from only one source. An upstream holding tank to handle the higher flows would be included in the plan or the capacity of the entire treatment system should be increased.

Response to Comment 126

Please see Response to Comment 136.

Comment 127

The water quality data presented in the report indicates extraordinarily high beta levels, with a maximum of 340 pCi/l, and other values over 60 pCi/l. What is the source of the beta radiation? Westminster has been told numerous times that the Rocky Flats Plant does not handle any beta emitting radionuclides, yet the testing results indicate very high levels of beta.

Response to Comment 127

The observed beta radiation arises from a variety of sources. Naturally occurring elements emitting beta include lead 210, potassium 40, radium 228, radon 226, cesium-137, and strontium 90. Most of the beta observed, however, likely results from decay products of the uranium 238 series: thorium 234 and protactinium 234.

Comment 128

A holding tank to store the effluent from the system should be included, which would enable testing of the effluent prior to discharge.

Response to Comment 128

Please refer to Response to Comment 17.

WRITTEN COMMENTS: CITY OF BROOMFIELD

Comment 129

At the outset, Broomfield wants to thank you for giving it the opportunity to comment on the Proposed Surface Water Interim Measures/Interim Remedial Action Plan for the 903 Pad, Mound, and East Trenches Areas (Operable Unit No. 2) (hereinafter "IRA Plan"). Broomfield supports clean up efforts at the Rocky Flats Plant ("RFP"), including efforts like those described in the IRA Plan that are directed at cleaning up contaminated surface water. Broomfield does not, however, fully embrace the IRA Plan for a number of reasons. First, the proposal is likely to be implemented before Broomfield's drinking water reservoir -- Great Western Reservoir -- is fully isolated from the RFP. And second, the proposal fails to recognize that bench and pilot scale studies should drive the selection of the alternative and not the selection of the action levels.

As discussed in the "Consolidated Comments of the cities of Broomfield, Thornton, Northglenn, Westminster, and Arvada on the environmental Restoration and Waste Management Site-Specific Plan - - Rocky Flats" dated September 28, 1990 (attached), the remediation efforts at the RFP should not take place until Standley Lake and Great Western Reservoir are fully isolated from the RFP. With the cooperation of all interested parties, an isolation project consisting of "Option B" plus "Option J" was formulated to achieve that risk reduction goal. "Option B" involves diverting the Standley Lake basin runoff into Great Western Reservoir and replacing Broomfield's existing Great Western Reservoir system with new water rights, a new reservoir, and a treatment plant. "Option J" involves water management at the RFP to control contamination at the source. Without this package in place, Standley Lake and great Western Reservoir remain at risk to further contamination resulting from the implementation of the IRA Plan -- a risk that the Broomfield cannot tolerate.

The specific threats to Great Western Reservoir from the actions proposed in the IRA Plan include the following:

> *The trench and sump installations will require a disturbance of potentially contaminated soils and, presumably, a wasting of the excess soils on-site. Additionally, it is likely that the installation of the treatment systems will also disturb potentially contaminated soils. Since the flows from high precipitation events are not being controlled and since there is no proposal for preventing wind dispersion of these potentially contaminated soils, they could wind up in Walnut Creek and ultimately Great Western Reservoir. Similarly, Broomfield is concerned about the potential for migration of the hazardous chemicals at the treatment plant that will be used in the treatment process, and the treatment plant residuals. The chemicals used at the treatment plan are similar to those in use at conventional municipal water treatment facilities.*

Response to Comment 129

With regard to the isolation project consisting of Options B and J, please refer to Response to Comment 122. The secondary containment and process control systems will virtually eliminate any releases of chemicals used at the treatment facility. Erosion control and resuspension of contaminated dust are addressed in Response to Comments 121, 8 (and 13), respectively.

The chemicals used at the treatment plant are similar to those in use at conventional municipal water treatment facilities.

Comment 130

The proposal fails to describe in detail the erosion control measures that will be in place to prevent downstream water quality problems. In addition, the proposal fails to suggest that these erosion control measures will be maintained throughout the life of the collection and treatment system.

Response to Comment 130

Please see Response to Comment 121.

Comment 131

The proposal fails to describe in detail how the debris collected in the sumps is to be cleaned out periodically.

Response to Comment 131

A vacuum truck will be used to remove sump debris. The vacuum line, attached to a pole would allow the worker to completely scan the bottom of each sump.

Comment 132

The truck transportation proposal is not particularly appealing. If the truck fails and seep water ends up on Indiana Street, it will flow from there either to Standley Lake or Great Western Reservoir.

Response to Comment 132

Because of this concern and others, seeps will not be collected in the Woman Creek drainage until further studies are completed. Please refer to our discussion of this matter in the Executive Summary of this document.

Comment 133

The proposal actually increases the contamination loading of Walnut Creek. Discharge from the system will go into Walnut Creek even though the inflow is from both Woman and Walnut Creeks. This is significant because the data suggests that Woman Creek has higher concentrations of radionuclides. If the system does not work (and this is a real possibility since treatment systems have not been demonstrated to be very effective for removing radionuclides) operation of that system will actually contaminate Walnut Creek instead of cleaning it up. Obviously, Broomfield cannot tolerate such a result. Perhaps the contaminated water from Woman Creek should not even be treated in the proposed system but should instead be treated at the existing RFP process waste facility.

Response to Comment 133

There is insufficient RFP process waste treatment capacity to accommodate the design flow for seeps in the Woman Creek drainage. However, the proposed treatment should be very effective in removing radionuclides. Nevertheless, because of this concern and others, seeps will not be collected in the Woman Creek drainage until further studies are completed. Please refer to our discussion of this matter in the Executive Summary.

Comment 134

The proposal does not provide for an effluent holding tank to ensure that the effluent meets the action levels prior to discharge into Walnut Creek.

Response to Comment 134

Please see Response to Comments 17 and 123.

Comment 135

In sum, Broomfield objects to the additional loading of Walnut Creek unless and until its Great Western Reservoir is fully isolated from the RFP. Otherwise, the risks of additional contamination of Walnut Creek are increased. These risks are real and EPA has, on other occasions, recognized them. One concern EPA has expressed is that if there is a release from the RFP during remediation efforts, the presence of the diversion ditch around Standley Lake proposed in "Option B" might extend the contamination beyond Standley Lake. Implicit in this concern is that there is a real potential for a release during the remediation activities. What is not clear, however, is why it is okay to sacrifice Standley Lake or Great Western Reservoir and not the South Platte River. Obviously, neither should be scarified. A zero-discharge system should be operational before any remediation takes place. At the very least, Broomfield is insisting that the First Steps Package of "Option B" be in place before any remediation takes place. Indeed, if there is "no immediate threat to public health and environment" as the IRA Plan indicates, see IRA Plan at Ex-1 (emphasis added), it would appear that there is no legitimate reason for proceeding with the work until Great Western Reservoir is fully isolated from the RFP.

Response to Comment 135

Please see our discussion in the Executive Summary regarding interbasin transfer of water. Also refer to Response to Comments 33 (zero discharge), 88 (no immediate threats), 121 (erosion control) and 122 (Option B).

Comment 136

Broomfield's other concern about the IRA Plan is the proposal to select an alternative without first completing bench and pilot scale testing. It is true that the IRA Plan acknowledges data gaps (e.g., the distribution and magnitude of the contamination needs better delineation, IRA Plan at 2-39, the flow data is based on a relatively short time period, IRA Plan at 4-11 to 4-15; and "[o]nly a small fraction of the data have been validated," IRA Plan at 2-39), and recommends treatability studies before full-scale operation. Interestingly, the treatability studies appear to be proposed for the purpose of justifying a deviation from the ARAR's instead of a fine tuning of the treatment system to accomplish the objectives of the IRA Plan. Broomfield believes that this is inappropriate. The pilot studies should be used to evaluate the performance of the preferred alternative. If the preferred alternative won't do the job, one of the other target alternatives should be evaluated. We should not just throw up our hands and say, "Oh, well" the ARAR's can't be met.

This seems especially true in this case since there is no analysis of whether treating the low flows is going to be effective. It may well be that the contaminants are effectively flushed out only during storm events. Perhaps a better approach would be to design the system to treat the average maximum seep flow resulting from a five or ten year design storm event.

In short, the final selection of an alternative is premature since the field treatability studies have not even started. The pilot scale studies should be evaluated before proceeding with full scale operation. Indeed, it seems incongruous to schedule construction of a full scale system without first evaluating the pilot scale studies. How many times have pilot plant operations revealed that laboratory bench scale results cannot be duplicated in the field? Additionally, since the IRA Plan indicates that there is "no immediate threat to public health and environment," IRA Plan at EX-1 (emphasis added), there should be no reason to gear up for full scale treatment until the pilot studies have been completed and evaluated.

Broomfield believes, therefore, that the pilot scale studies should proceed, and that the final preferred alternative should be selected after these studies are completed and evaluated. As the IRA Plan indicates, this final preferred alternative will require approval by the regulatory agencies. It goes without saying that the public should be involved in this decision as well. Broomfield requests that it be allowed to review the pilot scale results, the final preferred alternative, the proposed ARAR's and the proposed action levels.

Response to Comment 136

Please see Response to Comment 28 regarding achieving chemical-specific ARARs. Note that the schedule required by EPA and CDH does not allow for bench scale or off-site pilot studies prior to identifying the unit processes for full-scale generation.

With respect to design flows, we have chosen a flow that appears to be the highest non-storm-related discharge from the seeps. EPA and CDH have agreed to this concept as it will provide treatment for a significant quantity of the continuously discharging contaminated water. Current data does not show any correlation (or inverse correlation) between contaminant levels and flows. There is insufficient data to determine flows from 5 or 10 year storm events.

Comment 137

As a final comment, it seems that the proposal is not economically justified. The price tag is quite high and the proposed remediation technology:

a) is not bench or pilot scale tested;
b) treats a very small amount of water; and
c) may not meet the ARAR's.

It would appear that the money is better spent isolating the RFP from its neighbors and then implementing remediation activities that truly clean up the site.

Response to Comment 137

Please see Response to Comments 88 (imminent threats), 28 (ARARs), and 122 (Option B isolation plan).

WRITTEN COMMENTS: ROCKY FLATS CLEANUP COMMISSION

Comment 138

Page 1-1, Line 3, Are the NPDES criteria established for the treated effluent currently applicable to the known contaminants? Reference is made throughout Section 2 that treatment occurs "as necessary to meet the Plant's NPDES permit." However, no reference is provided to assist the reader in determining whether or not the NPDES criteria are germane to a current understanding of the contaminants present. In other words, when the NPDES treatment standards were agreed upon, did they include all of the contaminants (i.e., radionuclides) currently known to be present in the surface waters? Our understanding is that they do not. Thus, if the current NPDES treatment standards are not adequate in regard to the known contaminants, then we would disagree with the statement that there is no immediate threat to the public.

Response to Comment 138

Please see Response to Comment 5.

Comment 139

Section 2.1.1, Page 2-1. Why was reprocessing not mentioned as one of the activities at RFP? You only mention the manufacturing processes.

Response to Comment 139

Not mentioning plutonium reprocessing is a simple oversight. This will be noted in the revised text of Section 2.1.1.

Comment 140

Section 2.1.3, Pages 2-6/2-8. Why do you consistently downplay the plant's proximity to populated areas? You need to change your descriptions based on distance from the plant's boundaries rather than its center, to provide a clearer idea of your actual proximity to populated areas.

Response to Comment 140

Please see Response to Comment 39.

Section 2.1.3 will be modified to note the distance from the center of the plant to the plant boundary.

Comment 141

Section 2.2.3.2, Page 2-17. This section describes ground water occurrence in the surficial and bedrock units and goes on to describe it as a two-flow system that is hydraulically connected. There is, however, no mention or discussion of fractured bedrock (either at the interface of the alluvium and bedrock units or the presence of discrete fractures in the rock) which have the potential to transmit ground water at velocities that are far greater than either the alluvium or the bedrock. Additionally, there is little evidence presented that the analyst understands the physical or geologic materials aspects of the ground-water system. Experience in other areas of the Front Range has shown that the

fractured bedrock can locally be a distinct and important hydrogeologic unit. Is there any evidence to definitively confirm or deny the presence of a fractured bedrock material under the areas of interest? What is the experience on site associated with foundation or retention structure excavations.

For example, has there been a need for subsurface cutoffs or "keys into bedrock associated with the design and construction of the various retention structures? Additionally, in the bedrock that has been cored to date, have fractures been discovered or even noted (logged) in the boring logs or were all consideration of these important geologic features overlooked? There is certainly little or no evidence that the scientist involved with this component of the work is even aware of their significance or concerned about their presence. Until this portion of the hydrogeologic model can be qualified and quantified, any conclusions regarding the importance or appropriate remedies for ground-water contamination will be potentially flawed.

Response to Comment 141

Fracture data has been collected during the french drain project at the 881 Hillside. The bedrock in this area is roughly 3 to 30 feet below the surface and data shows that fractures exist and are more common at shallower levels.

OU 2 bedrock fracture information will be collected during conduct of the Phase II RI. Findings for the 903 Pad Area are expected to be similar to what has been observed at the 881 Hillside area. Implementation of a proposed Ground-Water IM/IRA for OU 2 has been deferred by the regulatory agencies, in part, because of lack of such information. This issue is addressed in Response to Comment 7.

Comment 142

Section 2.3.5.1, Page 2-35. In the third paragraph a mention is made regarding concern for the elevated alluvial ground water level of uranium at the 881 Hillside. Is it possible that HEPA filters are buried at 881 and maybe are the source of uranium and plutonium?

In this area (OU 2), just as in the 881 Hillside, the most prevalent organic compound found in high concentrations is bis (2-Ethylhexyl) Phthalate. The ubiquitous occurrence of this material in grossly contaminated areas of Rocky Flats requires some explanation. One guess is that the material named is a synonym for di-octyl phthalate which is used for testing HEPA filters of which 14,000 are reputed to be in use at RFP. Again, is it possible that the widespread finding of this chemical is marking the presence of large numbers of dangerously contaminated HEPA filters that are spent and are buried at the site.

Response to Comment 142

Please see Response to Comment 114.

Comment 143

Section 2.3.5.1, Page 2-36. It appears that field and laboratory studies have not been done to confirm isotopic identity of the seeps, dissolved fractions, particle sizes, and/or solubility or nature of insolubles in this area. The radioactive removal unit assumes ionic radioactive species. This is not an appropriate assumption. We would cite the following reports:

RFP 2901 Soil Decontamination at Rocky Flats
RFP 3914 Dust Transport-Wind Blown and Mechanical Resuspension

RFP 3130 Decontamination of Soil Containing Plutonium and Americium
RFP 3226 Removal of Plutonium Contaminated Soil from the 903 Lip Area During 1976 and 1978

These reports indicate that greater than 50% of the contamination at the 903 area is suspected to be in the less than 0.01 micron size range, whether colloidal and/or insoluble particles. If this study states that it is unable to quantify colloidal materials between the 0.1 and 0.45 micron size range, it is significant failing considering the earlier studies. (Especially considering the sizes are orders of magnitude different, etc.) It is important to identify solubles versus insolubles. If much of the contamination is soluble, it may be amenable to precipitation and flocculation. But if much of the contamination is in the insoluble form, and less than 0.01 microns in size, just how do you propose to deal with these extremely fine particles?

Response to Comment 143

Please see Response to Comment 6.

Comment 144

Section 2.3.6, Page 2-38. Air Contamination. There are several discrepancies noted. Ambient air concentration is stated to be approximately at or within 20.0 x 10 (minus 6) pCi/l. Do you mean pCi/m (cubed)? You have used an aqueous quantity measure where an air quantity measure should have been used. This has been noticed elsewhere in the report, where mg was used instead of pCi, etc. Please correct this and proofread this document for similar areas. The Gerhardt Langer resuspension report indicated much greater levels of airborne contaminants such as plutonium and americium. The DOE's Environmental Measurements Lab in New York has historically shown values of airborne contaminants in this area that have been orders of magnitude greater than the numbers cited within this report. Please explain these discrepancies in reporting. Perhaps it would be helpful to adopt Dr. Langer's oil to capture these minute particles that you seem to be missing. There is also a concern that the RFP is 'over correcting' for background radiation.

Response to Comment 144

Please see Response to Comment 10.

Comment 145

Section 3.3, Page 3-2. With regard to waiving the ARARs, we do not believe that they should be waived. Because the final action will not be in place until 1998, the ARARs should be met as soon as possible.

Response to Comment 145

Please see Response to Comment 28.

Comment 146

Page 4-2, Section 4.1.1. The discussion regarding seep SW-103 and the decision not to collect the seepage are superficial. No quantitative information is presented that demonstrates the basis for the decision, rather it is alluded that construction is going to be extremely difficult (and that it will create

possibly dangerous working conditions), that it will disturb a (contaminated) wetland area and that the construction may release significant quantities of contaminants downstream. The discussions make it clear that the Plant's management and DOE do not want to contain the seep in question. What is unclear is why and whether or not they have the discretion to make that decision. If it were an industrial site, the company would be required to clean it up regardless of the complexity. Why is it different here? Specifically, each of the concerns cited can be remedied at a cost. Whether the cost is acceptable or not is unclear because the report's authors chose not to perform a cost analysis even though cost was allegedly an evaluation factor. Instead, the authors claim to have discovered insurmountable technical concerns that make this remedy unacceptable.

Response to Comment 146

Installation of a surface water collection system at SW-103 presents construction difficulties not commensurate with the remediation benefits to be gained. Implementation of a complex design to collect the SW-103 seepage is also inconsistent with the fast-track schedule for an IM/IRA. It is therefore prudent to defer collection and treatment of SW-103 seepage until additional hydrogeological and contaminant characterization information is gathered that allows design of an effective remediation system at this location.

Comment 147

Pages 4-7/8, Table 4-1 lists dissolved gross alpha radiation at 17.70 pCi/l versus 632.0 pCi/l of total gross alpha radiation. Is this difference indicative of dissolved fractions versus insoluble fraction and/or colloidal particulates? There has been significant discussion amongst several physicists on oversight panels regarding the chemical forms of plutonium at the 903 area. Has the plutonium in soils and in seeps been identified to be ionic (eg: PuC14, PuNO3, etc.), or complexed with volatile organics in the elemental state? Some of the discussion centered around concerns regarding volatile and explosive characteristics. Please elaborate upon these discussions/information.

Response to Comment 147

Please see Response to Comment 12.

Comment 148

A complete isotopic characterization and identification has not been done. Since Coors reportedly dumped 238-Pu, 235-U, and other Project Pluto wastes at the 903 area, they should be participating as a co-Respondent and Potentially Responsible Party in the assessment and clean-up costs of this area. The failure to completely identify and quantify all radioactive isotopes in this area is a significant deficit, as this could aid in determining relative risk to workers and to the public represented by the spread and environmental migration of these contaminants due to any disturbance of this area. Dr. Whicker from CSU is currently studying the soils and isotopes in this area. Please provide this report for review (and/or progress reports).

Response to Comment 148

Please see Response to Comment 6 for a discussion of isotopic characterization.

Please see Response to Comment 37 for a discussion of identification of potential PRP's for the IM/IRA.

Dr. Whicker's reports will be placed in the public reading rooms.

Comment 149

Page 4-11, Section 4.3.1., second full paragraph: The design criteria for the collection system is defined as the maximum flows observed in 1988, 1989, and 1990, excluding flows related to high precipitation events. Why are the high events excluded? These high events tend to erode large volumes of sediment and, as a result, would be expected to transmit large volumes of contaminants. There is no basis for being able to represent that the flow observations of three years are representative or even reasonable for the design of a collection system. Most developed counties in Colorado require storm water retention structures designed for flows generated by the 100-year precipitation event. In a situation where potentially harmful chemical and radiological contaminants are being released, why isn't a more practical and acceptable design standard being used?

Response to Comment 149

The engineering and construction effort rises dramatically as the design flow for a surface water diversion and collection system increases and ultimately results in longer lead times to implement the project. The design flows selected for the Surface Water IM/IRA are intended to optimize protection of public health and the environment by timely implementation of an interim action that addresses maximum wet season flows. Moreover, the high precipitation events excluded from the IM/IRA scope occur infrequently.

Comment 150

Page 4-19, Second Paragraph. This paragraph discusses the approach being taken to empty each of the sumps that are installed. It is curious that the suggested approach is labor and equipment intensive. It would seem more appropriate to automate each sump with a float activated pump that periodically discharges its contents to either a single or to a several moderately-sized storage tanks that are centrally located. These tanks could either be emptied by tank trucks or pumped along larger pipelines to the treatment location.

Response to Comment 150

Surface water collected in CS-59 and CS-61 is proposed to be automatically transferred to the treatment system equalization tank in the manner that you describe. Collection and transport of Woman Creek drainage seeps will be evaluated in the future as discussed in the Executive Summary.

Comment 151

Page 4-19, Second Paragraph. In the description of the seep water collection methodology it is mentioned that Indiana Street outside the RFP boundary will be used as a tanker truck transport route. Given the alternative of building a road on the plant site and risking the resuspension of particulates, the proposed plan is only the "lesser of evils." All possible safety precautions must be investigated and implemented before any contaminants leave the plant site. Further, any trucks leaving the plant should be thoroughly inspected and washed of any contaminants that might be present.

Response to Comment 151

Because of this concern and others, seeps will not be collected in the Woman Creek drainage until further studies are completed. Please refer to our discussion of this matter in the Executive Summary.

Comment 152

Page 4-25, top paragraph. What exactly is present in the residual solids, or "sludges" as you describe them? We would like to review the Health and Safety Plan to ensure that workers will be adequately trained to handle the residuals.

Response to Comment 152

The sludge cake produced by the proposed cross-flow membrane filtration process will be composed of soil, silt, and clay particulates that occur naturally in surface water, and iron compounds resulting from chemical addition in the pretreatment step. The sludges will also undoubtedly contain "low level" concentrations of plutonium and possibly trace levels of volatile organic contaminants. You are welcome to review the SSHSP once it is prepared. It will be placed in the public reading room. See Response to Comment 13.

Comment 153

Page 4-35. Lab test must be conducted for the prescribed procedures. What is the efficiency of the system when you have low concentrations of plutonium? These lab tests must use actual site water samples in order to fully determine the feasibility of the described system.

Response to Comment 153

It is expected that this distribution will be relatively constant over the expected range of surface water plutonium concentrations. The plutonium removal efficiency is thus expected to be roughly the same at high and low concentrations. The exact removal efficiency will be determined in the treatability tests using actual OU 2 surface water that will be collected and treated in this IM/IRA.

Comment 154

Page 6-1, Section 6.1.1, second paragraph. What exactly happens to any overflow? Will you be treating only 10% of the water or perhaps even 20%? How quickly can you treat run-off?

Response to Comment 154

The overflow returns to the Walnut Creek drainage immediately downstream of the diversion weir. The IM/IRA system will be collecting and treating 100 percent of the flow from the designated seeps and stations up to the design flows discussed in Section 4. Flows in excess of the design flows may be allowed to pass the collection systems. The treatment system proposed is able to process surface water at rates of up to 60 gpm.

Comment 155

Page 6-8, bottom paragraph. Your described procedure for collecting the residual mentions the use of a dumpster. Is a "dumpster" adequate for handling the waste? What is the volume of filter cake and how radioactive is it?

Response to Comment 155

Please see Response to Comment 29. Footnote 5 on Table 4-6 estimates the maximum volume of filter cake produced based on a daily average influent flow of 20 gpm to be approximately 70 cubic feet annually. The radioactive nature of the filter cake will be characterized during the treatability studies.

Comment 156

Page 6-9, Section 6.1.2.3. We believe there should be continuous sampling procedures and not the "twice per week" schedule. You should also be testing the influent to the activated carbon columns for the presence of radionuclides. A holding tank should be installed between the filtration system and the GAC so testing can occur before any potentially contaminated water reaches the GAC. Also, a holding structure is necessary after the carbon units to allow testing for radionuclide contamination of the activated carbon columns. We would strongly encourage RFP use of the resultant "ultra-clean" water internally in order to achieve a goal of zero discharge from the plant.

Response to Comment 156

The optimal sampling schedule is a function of treatment system performance and the variability of the influent water quality. During the startup period, the sampling frequency will be greater than twice per week. Creation of a long-term sampling schedule is deferred pending the results from this initial operating period.

Samples of the influent to the GAC units will be obtained and analyzed for all contaminants of concern. Use of tanks to hold effluent from the cross-flow membrane process and GAC units until analyses can be performed is discussed in Response to Comment 17.

The zero plant discharge concept is discussed in Response to Comment 33.

Comment 157

Page 6-9, Section 6.1. Contrary to what is stated, the surface water collection system will not be relatively maintenance free. Sumps will fail and cleaning will be delayed as a result of budgetary considerations, schedule problems and manpower limitations. The system proposed requires an active presence and involvement of operations and management personnel. The omission of more passive systems in association with a component oriented to eliminating infiltration of surface and ground waters through the contaminated materials is a mistake in judgment that will end up costing more than need be.

Response to Comment 157

The surface water collection systems will require periodic maintenance for pump cleaning and replacement, sump and diversion structure cleaning, and pipeline maintenance. The IM/IRA Plan acknowledges this required labor in footnotes 6 and 8 in Table 4-5, "Assumed Costs For Surface Water Diversion and Collection Systems." Relative to the IM/IRA treatment process, however, the maintenance required for the collection systems is relatively low.

Comment 158

Page 6-10, Section 6.2.3. Is there a plan to test the activated carbon columns after they are saturated, for the presence of radionuclides? Given the fact that they are to be sent off-site for regeneration, public and worker safety demands the assurance of no possible radionuclide contamination.

Response to Comment 158

Please see Response to Comment 25.

Comment 159

Page 6-11, Section 6.3. The Community Relations Plan and the Health and Safety Plan should be reviewed by the public before construction begins.

Response to Comment 159

Please see Response to Comments 13 and 30.

Comment 160

Page 6-12. We would like to see the radionuclide extraction units tested first rather than accept the plan to bring the VOC and hydrocarbon extraction units onto line first.

Response to Comment 160

The schedule required by EPA and CDH for commencement of the field treatability study does not allow time to procure and install a cross-flow membrane filtration unit on the front-end of the GAC units. This issue becomes less of a concern with the deferment of collection and treatment of 903 Pad and Lip Area seeps.

Comment 161

Page 6-12, Section 6.4. The statement that starts on the seventh line from the bottom of the page indicates that the proposed method of treatment is not expected to attain chemical-specific ARARs for metal and radionuclides. It is astonishing that after going through the exercise, the selected approach will not achieve the necessary levels of treatment.

In that light, we suggest that the entire approach be reconsidered and refocus on two components:

1. *A system to limit the generation of contaminated ground water and surface water by installation of ground-water cutoffs, short and interim term capping of contaminated areas, diverting surface water runon and removing existing contaminated sediments in channels and ponds.*

2. *A system that collects all the remaining flows in adequately designed containment structures and treats those waters to ARAR levels.*

Additionally, we suggest that a qualified and experienced hydrogeologist, surface water hydrologist and civil engineer be added to the current project team. It appears that their expertise is needed to provide a more complete assessment of these important site areas.

Response to Comment 161

Please see Response to Comment 28 regarding ARARs. Your alternative remedial actions are suitable for a final action. The time frame set for this interim action does not permit consideration of such elaborate alternatives, which no doubt, are ultimately more effective than the current proposed interim action. The teams performing remedial investigations, feasibility studies, and interim action planning, design, and implementation are adequately staffed with qualified and experienced personnel.

Comment 162

The Reverse Osmosis Pilot Plant has not been listed as an alternative water treatment. Why not? This could save much effort and money, along with possibly being able to remove the more minute particles from the seeps.

Response to Comment 162

Please see Response to Comment 47.

Comment 163

It appears that you are planning to utilize water treatment equipment that is made of materials that could be subject to degradation by the chemicals and radionuclides that are supposed to be filtered or treated in these seeps.

Response to Comment 163

Please see Response to Comment 109.

Comment 164

Page 7-4, last paragraph. The Nevada site that is mentioned as a possible place for disposing of the dewatered solids is now closed. What will happen to the wastes and will they be in violation of RCRA? Can this low-level waste actually be a mixed waste that should be sent to WIPP? Exactly what type of waste is it, low-level or mixed?

Response to Comment 164

Please see Response to Comments 152 and 18.

Comment 165

Page 7-10, first full paragraph. You are to be congratulated for finally admitting there is at least an additive effect for total carcinogenic risk. We would like to see the risk analysis calculations.

You are advised to consult OSHA methodology for dealing with multiple contaminants in the workplace. Similar methodology is presented in the EPA publication, "Risk Assessment Guidance for Superfund, Volume I, Human Health Evaluation Manual (Part A."

Response to Comment 165

Please see Response to Comment 116.

Comment 166

We would like to obtain copies for review of the Environmental Restoration's Health and Safety Plan (ERHSPP), the Site-Specific Health and Safety Plan (SSHSP), the Phase II RFI/RIFS Workplan for OU 2, and the Plan for Contaminant Dispersion (PPCD).

Response to Comment 166

Please refer to Response to Comment 13. The Phase II RFI/RIFS Work Plan for OU 2 will be available in January 1991.

Comment 167

Plutonium transport by wind is notated as a significant and primary source of contaminant spread, but plutonium, americium, uranium, beryllium (plus any other dry contaminant) dust resuspension hazard is not addressed for safety measures for workers with respect to remediation efforts. We have serious concerns regarding encroachment on the 881 Hillside Area from these radioactive and/or chemical seeps, leachate, and resuspension. The workers currently working on remediation efforts at the 881 Area need to have the appropriate respiratory protection, especially in consideration of the radioactive dust resuspension problem. Inhalation of alpha particles is extremely hazardous. We would also remind you of our many requests for a containment building around remediation areas to control spread of contaminants during earth moving and other activities that will disturb these most contaminated areas of the plant site.

Response to Comment 167

Please see Response to Comment 8.

Comment 168

No significant evaluation was undertaken of alternatives to limit the amounts of contaminated surface water created in the area of interest. It appears foolish to eliminate alternatives that would limit the amount of contaminated water that requires treatment.

Response to Comment 168

Please see Response to Comment 149.

Comment 169

In Table A-9, the units mg/l should be changed to pCi/l.

Response to Comment 169

This is a typographical error. The units have been changed in the revised plan.

Comment 170

Although defense contractors have essentially infinite funding, documents like these should be printed single spaced, double sided to save resources, both financial and natural. Also printing in standard Courier 10 type would make it easier for some to read.

Response to Comment 170

Please see Response to Comment 1.

Comment 171

We would like to suggest that in the future, you allow at least a 6-week lead time from release of the document to the public comment hearing to be held for the document in question.

Response to Comment 171

Please refer to Response to Comment 21.

Comment 172

We suggest that a source containment program that addresses some or all of the following components be added to the IM/IRA list:

- *An engineered surface capping program to eliminate the infiltration of precipitation into and through the three contaminated areas of concern. Why continue contaminating surface or ground water in these areas? If they are probable sources, cap them even as a temporary measure. By cutting off the infiltrating precipitation, the amount of contaminated surface and ground water will be reduced.*

- *In areas where contaminated fine-grained materials are present and susceptible to wind transport or water erosion, cap them also using either inexpensive synthetic liners, a thin soil cap, or some of the inexpensive commercial dust suppressants (see the attachments describing dust suppressants).*

- *Place passive barriers to ground water movement around the three key areas. The placement of slurry walls, sheet pilings or drains to cutoff ground water flow from the up gradient direction is elementary, low risk, does not require extensive engineering or several years of data collection to accomplish.*

- *If cutoff structures are placed up gradient of the sources, a couple of wells in the source area will determine the effect. If it is found that the ground water is welling up from the underlying bedrock, then dewatering wells can be installed before the ground water is contaminated in the source areas.*

- *If sediments in the drainage ways or impoundments are contaminated, then excavate, dewater and stockpile them in covered waste piles.*

- *Design and install a surface water diversion system to keep surface sheet flow (runon) out of the area.*

- *Assess the sewage treatment plant effluent and, if necessary, pretreat it before it is discharged to Pond B-3.*

Response to Comment 172

Please see Response to Comments 111 and 112.

Comment 173

In general, it appears that there is not enough management interest in getting the subject area under control. Rather, the focus seems to be on dismissing the potential for immediate problems and in developing a collection and treatment system that is only a small component of the solution. At this rate, the final containment of this area and the elimination of the source materials will take decades to accomplish.

Response to Comment 173

This IM/IRA, although a small component of the solution, is being implemented by DOE at the request of EPA and CDH. However, DOE is also aggressively pursing the investigation and cleanup of the entire Rocky Flats Plant. Investigations have been conducted at the 881 Hillside Area, the 903 Pad, Mound and East Trenches Areas, and at various units being cleaned up under the Resource Conservation and Recovery Act. Construction of the **final** remedy for the 903 Pad, Mound and East Trenches Areas is scheduled to begin in January 1997.

SECTION 3

REMAINING CONCERNS

All issues pertaining to the proposed Surface Water IM/IRA for OU 2 have been resolved by this Responsiveness Summary. The objection to interbasin transfer of surface water from the Woman Creek drainage to the South Walnut Creek drainage has resulted in the elimination of such transfer and the deferment of the collection and treatment of the Woman Creek seeps. As discussed in the Executive Summary of this document, an addendum to the IM/IRA Plan will be prepared after conduct of the treatability studies. The addendum will present the proposed plan for collection and treatment of the Woman Creek seepage and should resolve any remaining concerns regarding these seeps.

ATTACHMENT 1

RISK ASSESSMENT CALCULATIONS

IN SUPPORT OF CONCLUSIONS

PRESENTED IN SECTION 7

OF THE IM/IRA PLAN

Risk Calculation Worksheet

903 Pad Surface Water Treatment — Written: 30-Aug-90
Fugative Dust during construction — Author: DCPalmer
Exposure of the Public — Printed: 31-Aug-90

Constants:

kg/mg	1.00E-06	
gm/kg	1.00E+03	
gm/mg	1.00E-03	
m3/ml	1.00E-06	
Sec Per Min	60	
Adult Body Weight	BWa 70	kg
Child Body Weight	BWc 15	kg
Adult Inhalation Rate	IRa 0.83	Cubic meters/hour
Worker Inhalation Rate	IRw 1.4	Cubic meters/hour
Child Inhalation Rate	IRc 0.625	Cubic meters/hour

Operationing Release Parameters

Exposure Time	ET 8	Hours/day
Exposure Frequency	EF 60	Days/year
Adult Exposure Duration	EDa 1	Years
Youth Exposure Duration	EDy 0	Years
Child Exposure Duration	EDc 1	Years
Averaging Time (carc.)	ATc 25550	Days
Adult Avg Time (non-carc.)	ATna 365	Days
Child Avg Time (non-carc.)	ATnc 365	Days
Public Dispersion Factor	Chi over Q 1.16E-06	sec/cubic meter
	Airborn Dust NA	mg/cubic meter
	Constr. Area 1.0	acres
	Dust Source 4.20E-04	kg/sec
	Job Duration 1.00	Years

Carcinogenic:

	Soil Conc (mg/kg)	Slope Factor SF	Source (mg/sec)	Air Conc (mg/m3)	Adult Intake (mg/kg-day)	Adult Risk	Child Lifetime Risk
Bis-(2-ethylhexyl)phthalate	9.70E-01	1.40E-02 (e)	4.07E-04	4.73E-10	1.06E-13	1.48E-15	5.18E-15
Manganese	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Mercury	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Nickel	0.00E+00	8.40E-01 (c)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Selenium	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Total	9.70E-01					1.48E-15	5.18E-15

Non-carcinogenic:

	Soil Conc (mg/kg)	RfD(a)	Source (mg/sec)	Air Conc (mg/m3)	Adult Intake (mg/kg/day)	Adult Risk	Child Intake (mg/kg/day)	Child Risk
Bis-(2-ethylhexyl)phthalate	9.70E-01	2.00E-02 (e)	4.07E-04	4.73E-10	7.40E-12	3.70E-10	2.59E-11	1.29E-09
Manganese	0.00E+00	3.00E-04 (c)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Mercury	0.00E+00	3.00E-04 (e)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Nickel	0.00E+00	2.00E-02 (d)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Selenium	0.00E+00	3.00E-03 (e)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Total	9.70E-01					3.70E-10		1.29E-09

Radionuclides:

	Soil Conc (uCi/gm)	DCF (mrem/uCi)	Source (uCi/sec)	Air Conc (uCi/m3)	Adult Intake (uCi)	Adult Dose (mrem)
Uranium	0.00E+00	1.30E+05	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Americium	3.68E-05	5.20E+05	1.54E-05	1.79E-11	7.16E-09	3.72E-03
Plutonium	2.45E-04	3.30E+05	1.03E-04	1.19E-10	4.77E-08	1.58E-02
Total	2.82E-04					1.95E-02

(a)RfDs based, where available, on Subchronic RfDs.
(b)Inhalation value, from IRIS
(c)Inhalation value, from HEAS, 4th Quarter, FY 1989
(d)Oral value, from IRIS
(e)Oral value, from HEAS, 4th Quarter, FY 1989

Dust Source = (1.2 tons/acre-month * Construction Area / (30 * 24 * 3600)) * 2000 lb\ton * .4536 kg/lb
Source = Dust source * Soil Concentration
Air concentration = source * (X/Q)
Intake = (Air concentration * IR * ET * EF * ED) / (BW * AT)
Risk (for cancer) = Intake * Slope Factor
Risk (non-cancer) = Intake / RfD
Intake (radionuclides) = air concentration * IR * ET * EF * job duration
Dose (radionuclides) = Intake * Dose Conversion Factor (DCF)

Risk Calculation Worksheet

903 Pad Surface Water Treatment
Fugative Dust during construction
Exposure of Other Site Workers

Written: 30-Aug-90
Author: DCPalmer
Printed: 31-Aug-90

Constants:

kg/mg	1.00E-06	
gm/kg	1.00E+03	
gm/mg	1.00E-03	
m3/ml	1.00E-06	
Sec Per Min	60	
Adult Body Weight	BWa 70	kg
Child Body Weight	BWc 15	kg
Adult Inhalation Rate	IRa 0.83	Cubic meters/hour
Worker Inhalation Rate	IRw 1.4	Cubic meters/hour
Child Inhalation Rate	IRc 0.625	Cubic meters/hour

Operationing Release Parameters

Exposure Time	ET 8	Hours/day
Exposure Frequency	EF 60	Days/year
Adult Exposure Duration	EDa 1	Years
Youth Exposure Duration	EDy 0	Years
Child Exposure Duration	EDc 1	Years
Averaging Time (carc.)	ATc 25550	Days
Adult Avg Time (non-carc.)	ATna 365	Days
Child Avg Time (non-carc.)	ATnc 365	Days
Worker Dispersion Factor	Chi over Q 8.46E-05	sec/cubic meter
	Airborn Dust NA	mg/cubic meter
	Constr. Area 1.0	acres
	Dust Source 4.20E-04	kg/sec
	Job Duration 1.00	Years

Carcinogenic:

	Soil Conc (mg/kg)	Slope Factor SF	Source (mg/sec)	Air Conc (mg/m3)	Adult Intake (mg/kg-day)	Adult Risk
Bis-(2-ethylhexyl)phthalate	9.70E-01	1.40E-02	(e)4.07E-04	3.45E-08	7.71E-12	1.08E-13
Manganese	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Mercury	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Nickel	0.00E+00	8.40E-01	(c)0.00E+00	0.00E+00	0.00E+00	0.00E+00
Selenium	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Total	9.70E-01					1.08E-13

Non-carcinogenic:

	Soil Conc (mg/kg)	RfD(a)	Source (mg/sec)	Air Conc (mg/m3)	Adult Intake (mg/kg/day)	Adult Risk
Bis-(2-ethylhexyl)phthalate	9.70E-01	2.00E-02	(e)4.07E-04	3.45E-08	5.40E-10	2.70E-08
Manganese	0.00E+00	3.00E-04	(c)0.00E+00	0.00E+00	0.00E+00	0.00E+00
Mercury	0.00E+00	3.00E-04	(e)0.00E+00	0.00E+00	0.00E+00	0.00E+00
Nickel	0.00E+00	2.00E-02	(d)0.00E+00	0.00E+00	0.00E+00	0.00E+00
Selenium	0.00E+00	3.00E-03	(e)0.00E+00	0.00E+00	0.00E+00	0.00E+00
Total	9.70E-01					2.70E-08

Radionuclides:

	Soil Conc (uCi/gm)	DCF (mrem/uCi)	Source (uCi/sec)	Air Conc (uCi/m3)	Adult Intake (uCi)	Adult Dose (mrem)
Uranium	0.00E+00	1.30E+05	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Americium	3.68E-05	5.20E+05	1.54E-05	1.31E-09	5.22E-07	2.72E-01
Plutonium	2.45E-04	3.30E+05	1.03E-04	8.71E-09	3.48E-06	1.15E+00
Total	2.82E-04					1.42E+00

(a)RfDs based, where available, on Subchronic RfDs.
(b)Inhalation value, from IRIS
(c)Inhalation value, from HEAS, 4th Quarter, FY 1989
(d)Oral value, from IRIS
(e)Oral value, from HEAS, 4th Quarter, FY 1989

Dust Source = (1.2 tons/acre-month * Construction Area / (30 * 24 * 3600)) * 2000 lb\ton * .4536 kg/lb
Source = Dust source * Soil Concentration
Air concentration = source • (X/Q)
Intake = (Air concentration • IR * ET • EF * ED) / (BW * AT)
Risk (for cancer) = Intake • Slope Factor
Risk (non-cancer) = Intake / RfD
Intake (radionuclides) = air concentration * IR • ET * EF * job duration
Dose (radionuclides) = Intake • Dose Conversion Factor (DCF)

Risk Calculation Worksheet

903 Pad Surface Water Treatment
Fugative Dust during construction
Exposure of Construction Workers

Written: 30-Aug-90
Author: DCPalmer
Printed: 31-Aug-90

Constants:

	kg/mg	1.00E-06	
	gm/kg	1.00E+03	
	gm/mg	1.00E-03	
	m3/ml	1.00E-06	
	Sec Per Min	60	
Adult Body Weight	BWa	70	kg
Child Body Weight	BWc	15	kg
Adult Inhalation Rate	IRa	0.83	Cubic meters/hour
Worker Inhalation Rate	IRw	1.4	Cubic meters/hour
Child Inhalation Rate	IRc	0.625	Cubic meters/hour

Operationing Release Parameters

Exposure Time	ET	8	Hours/day
Exposure Frequency	EF	60	Days/year
Adult Exposure Duration	EDa	1	Years
Youth Exposure Duration	EDy	NA	Years
Child Exposure Duration	EDc	NA	Years
Averaging Time (carc.)	ATc	25550	Days
Adult Avg Time (non-carc.)	ATna	365	Days
Child Avg Time (non-carc.)	ATnc	NA	Days
Worker Dispersion Factor	Chi over Q	NA	sec/cubic meter
	Airborn Dust	5	mg/cubic meter
	Constr. Area	NA	acres
	Dust Source	NA	kg/sec
	Job Duration	1.00	Years

Carcinogenic:

	Soil Conc (mg/kg)	Slope Factor SF		Source (mg/sec)	Air Conc (mg/m3)	------Adult------ Intake (mg/kg-day)	Risk
Bis-(2-ethylhexyl)phthalate	9.70E-01	1.40E-02	(e)	NA	4.85E-06	1.08E-09	1.52E-11
Manganese	0.00E+00	0.00E+00		NA	0.00E+00	0.00E+00	0.00E+00
Mercury	0.00E+00	0.00E+00		NA	0.00E+00	0.00E+00	0.00E+00
Nickel	0.00E+00	8.40E-01	(c)	NA	0.00E+00	0.00E+00	0.00E+00
Selenium	0.00E+00	0.00E+00		NA	0.00E+00	0.00E+00	0.00E+00
Total	9.70E-01						1.52E-11

Non-carcinogenic:

	Soil Conc (mg/kg)	RfD		Source (mg/sec)	Air Conc (mg/m3)	------Adult------ Intake (mg/kg/day)	Risk
Bis-(2-ethylhexyl)phthalate	9.70E-01	2.00E-02	(e)	NA	4.85E-06	7.59E-08	3.80E-06
Manganese	0.00E+00	3.00E-04	(c)	NA	0.00E+00	0.00E+00	0.00E+00
Mercury	0.00E+00	3.00E-04	(e)	NA	0.00E+00	0.00E+00	0.00E+00
Nickel	0.00E+00	2.00E-02	(d)	NA	0.00E+00	0.00E+00	0.00E+00
Selenium	0.00E+00	3.00E-03	(e)	NA	0.00E+00	0.00E+00	0.00E+00
Total	9.70E-01						3.80E-06

Radionuclides:

	Soil Conc (uCi/gm)	DCF (mrem/uCi)	Source (uCi/sec)	Air Conc (uCi/m3)	------Adult------ Intake (uCi)	Dose (mrem)
Uranium	0.00E+00	1.30E+05	NA	0.00E+00	0.00E+00	0.00E+00
Americium	3.68E-05	5.20E+05	NA	1.84E-07	7.35E-05	3.82E+01
Plutonium	2.45E-04	3.30E+05	NA	1.23E-06	4.90E-04	1.62E+02
Total	2.82E-04					2.00E+02

(a)RfDs based, where available, on Subchronic RfDs.
(b)Inhalation value, from IRIS
(c)Inhalation value, from HEAS, 4th Quarter, FY 1989
(d)Oral value, from IRIS
(e)Oral value, from HEAS, 4th Quarter, FY 1989

Air concentration = Soil concentration * airborn dust * kg/mg
Intake = (Air concentration * IR * ET * EF * ED) / (BW * AT)
Risk (for cancer) = Intake * Slope Factor
Risk (non-cancer) = Intake / RfD
Intake (radionuclides) = air concentration * IR * ET * EF * job duration
Dose (radionuclides) = Intake * Dose Conversion Factor (DCF)

Risk Calculation Worksheet

903 Pad Surface Water Treatment
Fugative Dust from Liquid Transfer Truck
Exposure of the Public

Written: 30-Aug-90
Author: DCPalmer
Printed: 31-Aug-90

Constants:

Adult Body Weight	BWa	70	kg	kg/mg	1.00E-06
Child Body Weight	BWc	15	kg	gm/kg	1.00E+03
Adult Inhalation Rate	IRa	0.83	Cubic meters/hour	gm/mg	1.00E-03
Worker Inhalation Rate	IRw	1.4	Cubic meters/hour	m3/ml	1.00E-06
Child Inhalation Rate	IRc	0.625	Cubic meters/hour	Sec Per Min	60

Operationing Release Parameters:

Exposure Time	ET	24	Hours/day
Exposure Frequency	EF	365	Days/year
Adult Exposure Duration	EDa	30	Years
Youth Exposure Duration	EDy	25	Years
Child Exposure Duration	EDc	5	Years
Averaging Time (carc.)	ATc	25550	Days
Adult Avg Time (non-carc.)	ATna	10950	Days
Child Avg Time (non-carc.)	ATnc	1825	Days

Public Dispersion Factor	Chi over Q	1.16E-06	sec/cubic meter
Vehicle Dust Generation Rate	Avg Gen Rate	1.68	Kg per vehicle mile
	Annual Dist	1.04E+03	Miles / year
	Dust Source	5.54E-05	kg/sec
	Job Duration	1.00	Years

Carcinogenic:

	Soil Conc (mg/kg)	Slope Factor SF		Source (mg/sec)	Air Conc (mg/m3)	Adult Intake (mg/kg-day)	Adult Risk	Child Lifetime Risk
Bis-(2-ethylhexyl)phthalate	9.70E-01	1.40E-02	(e)	5.37E-05	6.23E-11	7.63E-12	1.07E-13	6.24E-14
Manganese	0.00E+00	0.00E+00		0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Mercury	0.00E+00	0.00E+00		0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Nickel	0.00E+00	8.40E-01	(c)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Selenium	0.00E+00	0.00E+00		0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Total	9.70E-01						1.07E-13	6.24E-14

Non-carcinogenic:

	Soil Conc (mg/kg)	RfD		Source (mg/sec)	Air Conc (mg/m3)	Adult Intake (mg/kg/day)	Adult Risk	Child Intake (mg/kg/day)	Child Risk
Bis-(2-ethylhexyl)phthalate	9.70E-01	2.00E-02	(e)	5.37E-05	6.23E-11	1.78E-11	8.91E-10	6.23E-11	3.12E-09
Manganese	0.00E+00	3.00E-04	(c)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Mercury	0.00E+00	3.00E-04	(e)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Nickel	0.00E+00	2.00E-02	(d)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Selenium	0.00E+00	3.00E-03	(e)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Total	9.70E-01						8.91E-10		3.12E-09

Radionuclides:

	Soil Conc (uCi/gm)	DCF (mrem/uCi)	Source (uCi/sec)	Air Conc (uCi/m3)	Adult Intake (uCi)	Adult Dose (mrem)
Uranium	0.00E+00	1.30E+05	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Americium	3.68E-05	5.20E+05	2.04E-06	2.36E-12	1.72E-08	8.97E-03
Plutonium	2.45E-04	3.30E+05	1.36E-05	1.57E-11	1.15E-07	3.79E-02
Total	2.82E-04					4.69E-02

(a)RfDs based, where available, on Subchronic RfDs.
(b)Inhalation value, from IRIS
(c)Inhalation value, from HEAS, 4th Quarter, FY 1989
(d)Oral value, from IRIS
(e)Oral value, from HEAS, 4th Quarter, FY 1989

Dust source = (Average generation rate * annual distance) / (365 * 24 * 3600)
Source = Dust source * Soil Concentration
Air concentration = source * (X/Q)
Intake = (Air concentration * IR * ET * EF * ED) / (BW * AT)
Risk (for cancer) = Intake * Slope Factor
Risk (non-cancer) = Intake / RfD
Intake (radionuclides) = air concentration * IR * ET * EF * job duration
Dose (radionuclides) = Intake * Dose Conversion Factor (DCF)

Risk Calculation Worksheet

903 Pad Surface Water Treatment
Fugative Dust from Liquid Transfer Truck
Exposure of Other Workers on Site

Written: 30-Aug-90
Author: DCPalmer
Printed: 31-Aug-90

Constants:

Adult Body Weight	BWa	70	kg	kg/mg	1.00E-06
Child Body Weight	BWc	15	kg	gm/kg	1.00E+03
Adult Inhalation Rate	IRa	0.83	Cubic meters/hour	gm/mg	1.00E-03
Worker Inhalation Rate	IRw	1.4	Cubic meters/hour	m3/ml	1.00E-06
Child Inhalation Rate	IRc	0.625	Cubic meters/hour	Sec Per Min	60

Operationing Release Parameters

Exposure Time	ET	24	Hours/day
Exposure Frequency	EF	365	Days/year
Adult Exposure Duration	EDa	30	Years
Youth Exposure Duration	EDy	25	Years
Child Exposure Duration	EDc	5	Years
Averaging Time (carc.)	ATc	25550	Days
Adult Avg Time (non-carc.)	ATna	10950	Days
Child Avg Time (non-carc.)	ATnc	1825	Days

Worker Dispersion Factor	Chi over Q	1.58E-05	sec/cubic meter
Vehicle Dust Generation Rate	Avg Gen Rate	1.68	Kg per vehicle mile
	Annual Dist	1040.0	Miles / year
	Dust Source	5.54E-05	kg/sec
	Job Duration	1.00	Years

Carcinogenic:

	Soil Conc (mg/kg)	Slope Factor SF		Source (mg/sec)	Air Conc (mg/m3)	------Adult------- Intake (mg/kg-day)	Risk
Bis-(2-ethylhexyl)phthalate	9.70E-01	1.40E-02	(e)	5.37E-05	8.49E-10	1.04E-10	1.46E-12
Manganese	0.00E+00	0.00E+00		0.00E+00	0.00E+00	0.00E+00	0.00E+00
Mercury	0.00E+00	0.00E+00		0.00E+00	0.00E+00	0.00E+00	0.00E+00
Nickel	0.00E+00	8.40E-01	(c)	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Selenium	0.00E+00	0.00E+00		0.00E+00	0.00E+00	0.00E+00	0.00E+00
Total	9.70E-01						1.46E-12

Non-carcinogenic:

	Soil Conc (mg/kg)	RfD(a)		Source (mg/sec)	Air Conc (mg/m3)	------Adult------- Intake (mg/kg/day)	Risk
Bis-(2-ethylhexyl)phthalate	9.70E-01	2.00E-02	(e)	5.37E-05	6.23E-11	1.78E-11	8.91E-10
Manganese	0.00E+00	3.00E-04	(c)	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Mercury	0.00E+00	3.00E-04	(e)	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Nickel	0.00E+00	2.00E-02	(d)	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Selenium	0.00E+00	3.00E-03	(e)	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Total	9.70E-01						8.91E-10

Radionuclides:

	Soil Conc (uCi/gm)	DCF (mrem/uCi)	Source (uCi/sec)	Air Conc (uCi/m3)	------Adult------- Intake (uCi)	Dose (mrem)
Uranium	0.00E+00	1.30E+05	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Americium	3.68E-05	5.20E+05	2.04E-06	3.22E-11	2.35E-07	1.22E-01
Plutonium	2.45E-04	3.30E+05	1.36E-05	2.14E-10	1.57E-06	5.17E-01
Total	2.82E-04					6.39E-01

(a)RfDs based, where available, on Subchronic RfDs.
(b)Inhalation value, from IRIS
(c)Inhalation value, from HEAS, 4th Quarter, FY 1989
(d)Oral value, from IRIS
(e)Oral value, from HEAS, 4th Quarter, FY 1989

Dust source = (Average generation rate • annual distance) / (365 * 24 * 3600)
Source = Dust source * Soil Concentration
Air concentration = source * (X/Q)
Intake = (Air concentration * IR • ET * EF • ED) / (BW * AT)
Risk (for cancer) = Intake * Slope Factor
Risk (non-cancer) = Intake / RfD
Intake (radionuclides) = air concentration * IR • ET * EF • job duration
Dose (radionuclides) = Intake * Dose Conversion Factor (DCF)

Risk Calculation Worksheet

903 Pad Surface Water Treatment
Collection Tank Venting
Exposure of the Public

Written: 30-Aug-90
Author: DCPalmer
Printed: 30-Aug-90

Constants:

Liter Per Gal	3.7853	
Sec Per Min	60	
R	62.37	mmHg l/gmole K
N/V	3.28E+01	
kg/mg	1.00E-06	
gm/kg	1.00E+03	
gm/mg	1.00E-03	
m3/ml	1.00E-06	

Adult Body Weight	BWa	70	kg
Child Body Weight	BWc	15	kg
Adult Inhalation Rate	IRa	0.83	Cubic meters/hour
Worker Inhalation Rate	IRW	1.4	Cubic meters/hour
Child Inhalation Rate	IRc	0.625	Cubic meters/hour

Operationing Release Parameters

Exposure Time	ET	24	Hours/day
Exposure Frequency	EF	265	Days/year
Adult Exposure Duration	EDa	30	Years
Youth Exposure Duration	EDy	25	Years
Child Exposure Duration	EDc	5	Years
Averaging Time (carc.)	ATc	25550	Days
Adult Avg Time (non-carc.)	ATna	10950	Days
Child Avg Time (non-carc.)	ATnc	1825	Days

Public Dispersion Factor	Chi over Q	1.16E-06	sec/cubic meter
	Job Duration	NA	Years
	Flow Rate	60	gpm

Carcinogenic:

	Vapor Conc (mg/l)	Slope Factor SF		Source (mg/sec)	Air Conc (mg/m3)	Adult Intake (mg/kg/day)	Adult Risk	Child Lifetime Risk
Carbon Tetrachloride	2.24E-05	1.30E-01	(b)	8.48E-05	9.84E-11	8.75E-12	1.14E-12	2.26E-12
Acetone	1.81E-05	0.00E+00		6.85E-05	7.95E-11	7.07E-12	0.00E+00	0.00E+00
1,1-Dichlorethene	6.40E-05	1.20E+00	(b)	2.42E-04	2.81E-10	2.50E-11	4.20E-11	5.95E-11
1,2-Dichloroethene	1.69E-06	0.00E+00		6.42E-06	7.44E-12	6.62E-13	0.00E+00	0.00E+00
Tetrachloroethene	3.48E-06	3.30E-03	(c)	1.32E-05	1.53E-11	1.36E-12	6.27E-15	8.88E-15
Trichloroethene	1.83E-05	1.70E-02	(c)	6.94E-05	8.05E-11	7.15E-12	1.70E-13	2.41E-13
Methylene Chloride	1.18E-05	1.40E-02	(b)	4.47E-05	5.19E-11	4.61E-12	9.04E-14	1.28E-13
Vinyl Chloride	3.06E-05	2.95E-01	(c)	1.16E-04	1.34E-10	1.20E-11	4.94E-12	6.99E-12
1,1 Dichloroethane	3.02E-06	9.10E-02	(e)	1.14E-05	1.33E-11	1.18E-12	1.50E-13	2.13E-13
Carbon Disulfide	1.51E-06	0.00E+00		5.72E-06	6.64E-12	5.90E-13	0.00E+00	0.00E+00
Totals	1.75E-04						4.85E-11	6.93E-11

Non-carcinogenic:

	Vapor Conc (mg/l)	RfD(a)		Source (mg/sec)	Air Conc (mg/m3)	Adult Intake (mg/kg/day)	Adult Risk	Child Intake (mg/kg/day)	Child Risk
Carbon Tetrachloride	2.24E-05	7.00E-04	(e)	8.48E-05	9.84E-11	2.04E-11	2.92E-08	7.14E-11	1.02E-07
Acetone	1.81E-05	1.00E-01	(e)	6.85E-05	7.95E-11	1.65E-11	1.65E-10	5.77E-11	5.77E-10
1,1-Dichlorethene	6.40E-05	9.00E-03	(d)	2.42E-04	2.81E-10	5.83E-11	6.48E-09	2.04E-10	2.27E-08
1,2-Dichloroethene	1.69E-06	2.00E-02	(e)	6.42E-06	7.44E-12	1.54E-12	7.72E-11	5.40E-12	2.70E-10
Tetrachloroethene	3.48E-06	1.00E-02	(e)	1.32E-05	1.53E-11	3.17E-12	3.17E-10	1.11E-11	1.11E-09
Trichloroethene	1.83E-05	NA		6.94E-05	8.05E-11	1.67E-11	NA	5.84E-11	NA
Methylene Chloride	1.18E-05	6.00E-02	(d)	4.47E-05	5.19E-11	1.08E-11	1.79E-10	3.77E-11	6.28E-10
Vinyl Chloride	3.06E-05	NA		1.16E-04	1.34E-10	2.79E-11	NA	9.76E-11	NA
1,1 Dichloroethane	3.02E-06	1.00E-01	(c)	1.14E-05	1.33E-11	2.75E-12	2.75E-11	9.64E-12	9.64E-11
Carbon Disulfide	1.51E-06	NA		5.72E-06	6.64E-12	1.38E-12	NA	4.82E-12	NA
Totals	1.75E-04						3.64E-08		1.27E-07

(a)RfDs based, where available, on Subchronic RfDs.
(b)Inhalation value, from IRIS
(c)Inhalation value, from HEAS, 4th Quarter, FY 1989
(d)Oral value, from IRIS
(e)Oral value, from HEAS, 4th Quarter, FY 1989

Source = Vapor concentration • flow rate * liters per gallon/seconds per minute
Air concentration = source * (X/Q)
Intake = (Air concentration * IR • ET * EF * ED) / (BW * AT)
Risk (for cancer) = Intake * Slope Factor
Risk (non-cancer) = Intake / RfD

Risk Calculation Worksheet

903 Pad Surface Water Treatment
Collection Tank Venting
Exposure of RFP Workers

Written: 30-Aug-90
Author: DCPalmer
Printed: 30-Aug-90

Constants:

Liter Per Gal	3.7853	
Sec Per Min	60	
R	62.37	mmHg l/gmole K
N/V	3.28E+01	
kg/mg	1.00E-06	
gm/kg	1.00E+03	
gm/mg	1.00E-03	
m3/ml	1.00E-06	

Adult Body Weight	BWa	70	kg
Child Body Weight	BWc	15	kg
Adult Inhalation Rate	IRa	0.83	Cubic meters/hour
Worker Inhalation Rate	IRw	1.4	Cubic meters/hr
Child Inhalation Rate	IRc	0.625	Cubic meters/hour

Operationing Release Parameters

Exposure Time	ET	24	Hours/day
Exposure Frequency	EF	265	Days/year
Adult Exposure Duration	EDa	30	Years
Youth Exposure Duration	EDy	25	Years
Child Exposure Duration	EDc	5	Years
Averaging Time (carc.)	ATc	25550	Days
Adult Avg Time (non-carc.)	ATna	10950	Days
Child Avg Time (non-carc.)	ATnc	1825	Days

Worker Dispersion Factor	Chi over Q	8.46E-05	sec/cubic meter
	Job Duration	NA	Years
	Flow Rate	60	gpm

Carcinogenic:

	Conc (mg/l)	Slope Factor SF		Source (mg/sec)	Air Conc (mg/m3)	Intake (mg/kg/day)	Risk
Carbon Tetrachloride	2.24E-05	1.30E-01	(b)	8.48E-05	7.18E-09	6.38E-10	8.29E-11
Acetone	1.81E-05	0.00E+00		6.85E-05	5.80E-09	5.15E-10	0.00E+00
1,1-Dichlorethene	6.40E-05	1.20E+00	(b)	2.42E-04	2.05E-08	1.82E-09	2.19E-09
1,2-Dichloroethene	1.69E-06	0.00E+00		6.42E-06	5.43E-10	4.83E-11	0.00E+00
Tetrachloroethene	3.48E-06	3.30E-03	(c)	1.32E-05	1.11E-09	9.89E-11	3.27E-13
Trichloroethene	1.83E-05	1.70E-02	(c)	6.94E-05	5.87E-09	5.22E-10	8.87E-12
Methylene Chloride	1.18E-05	1.40E-02	(b)	4.47E-05	3.78E-09	3.36E-10	4.71E-12
Vinyl Chloride	3.06E-05	2.95E-01	(c)	1.16E-04	9.80E-09	8.72E-10	2.57E-10
1,1 Dichloroethane	3.02E-06	9.10E-02	(e)	1.14E-05	9.68E-10	8.61E-11	7.83E-12
Carbon Disulfide	1.51E-06	0.00E+00		5.72E-06	4.84E-10	4.30E-11	0.00E+00
Totals	1.75E-04						2.55E-09

Non-carcinogenic:

	Conc (mg/l)	RfD		Source (mg/sec)	Air Conc (mg/m3)	Intake (mg/kg/day)	Risk
Carbon Tetrachloride	2.24E-05	7.00E-04	(e)	8.48E-05	7.18E-09	1.49E-09	2.13E-06
Acetone	1.81E-05	1.00E-01	(e)	6.85E-05	5.80E-09	1.20E-09	1.20E-08
1,1-Dichlorethene	6.40E-05	9.00E-03	(d)	2.42E-04	2.05E-08	4.25E-09	4.72E-07
1,2-Dichloroethene	1.69E-06	2.00E-02	(e)	6.42E-06	5.43E-10	1.13E-10	5.63E-09
Tetrachloroethene	3.48E-06	1.00E-02	(e)	1.32E-05	1.11E-09	2.31E-10	2.31E-08
Trichloroethene	1.83E-05	NA		6.94E-05	5.87E-09	1.22E-09	NA
Methylene Chloride	1.18E-05	6.00E-02	(d)	4.47E-05	3.78E-09	7.85E-10	1.31E-08
Vinyl Chloride	3.06E-05	NA		1.16E-04	9.80E-09	2.03E-09	NA
1,1 Dichloroethane	3.02E-06	1.00E-01	(c)	1.14E-05	9.68E-10	2.01E-10	2.01E-09
Carbon Disulfide	1.51E-06	NA		5.72E-06	4.84E-10	1.00E-10	NA
Totals	1.75E-04						2.66E-06

(a)RfDs based, where available, on Subchronic RfDs.
(b)Inhalation value, from IRIS
(c)Inhalation value, from HEAS, 4th Quarter, FY 1989
(d)Oral value, from IRIS
(e)Oral value, from HEAS, 4th Quarter, FY 1989

Source = Vapor concentration • flow rate * liters per gallon/seconds per minute
Air concentration = source * (X/Q)
Intake = (Air concentration • IR • ET • EF * ED) / (BW • AT)
Risk (for cancer) = Intake * Slope Factor
Risk (non-cancer) = Intake / RfD

Vapor concentration calculation
903 Pad Surface Water Treatment
Collection Tank Venting

Printed: 30-Aug-90
Written: 04-Aug-90
Author: DCPalmer

	Liq Conc (mg/l)	Molecular Weight	g_moles/l	Liq mole Fraction	Vap Press (mm Hg)	Partial Prs (mm Hg)	PP Fract	Vap Conc
Carbon Tetrachloride	2.49E-01	153.84	1.62E-06	2.92E-08	91.17	2.66E-06	4.44E-09	2.24E-05
Acetone	9.90E-02	58.08	1.70E-06	3.08E-08	185.20	5.70E-06	9.50E-09	1.81E-05
1,1-Dichlorethene	1.27E-01	96.95	1.31E-06	2.36E-08	510.56	1.21E-05	2.01E-08	6.40E-05
1,2-Dichloroethene	1.00E-02	96.95	1.03E-07	1.86E-09	171.69	3.20E-07	5.33E-10	1.69E-06
Tetrachloroethene	2.35E-01	165.85	1.42E-06	2.56E-08	14.98	3.83E-07	6.38E-10	3.48E-06
Trichloroethene	2.98E-01	131.4	2.27E-06	4.09E-08	62.28	2.55E-06	4.25E-09	1.83E-05
Methylene Chloride	3.40E-02	84.93	4.00E-07	7.22E-09	351.86	2.54E-06	4.24E-09	1.18E-05
Vinyl Chloride	1.10E-02	133.41	8.25E-08	1.49E-09	2819.28	4.20E-06	6.99E-09	3.06E-05
1,1 Dichloroethane	6.00E-03	98.96	6.06E-08	1.09E-09	510.56	5.59E-07	9.31E-10	3.02E-06
Carbon Disulfide	5.00E-03	76.14	6.57E-08	1.19E-09	306.22	3.63E-07	6.05E-10	1.51E-06
Water	0	18.02	5.54E+01	1.00E+00	18.69	1.87E+01	3.12E-02	1.84E+01
Totals	0.00E+00		5.54E+01			6.00E+02		

Gram-moles per liter = (liquid concentration / 1000) / molecular weight
Liquid mole fraction = gram-moles per liter / total gram-moles
Partial pressure = vapor pressure * liquid mole fraction
Partial pressure fraction = partial pressure / atmospheric pressure
Vapor concentration = partial pressure fraction * (N/V) * molecular weight

Vapor Pressure Calculation

Printed: 30-Aug-90
Written: 04-Aug-90
Author: DCPalmer

	T1	P1	T2	P2	T1(K)	T2(K)	(20-T1)/(T2-T1)	Log P	P
Carbon Tetrachloride	4.3	40	23	100	277.4	296.1	8.93E-01	1.96	91.17
Acetone	7.7	100	39.5	400	280.8	312.6	4.18E-01	2.27	185.20
1,1-Dichlorethene	14.8	400	31.7	760	287.9	304.8	3.67E-01	2.71	510.56
1,2-Dichloroethene	9.5	100	41	400	282.6	314.1	3.65E-01	2.23	171.69
Tetrachloroethene	13.8	10	40.1	40	286.9	313.2	2.74E-01	1.18	14.98
Trichloroethene	11.9	40	31.4	100	285	304.5	4.67E-01	1.79	62.28
Methylene Chloride	-6.3	100	24.1	400	266.8	297.2	8.98E-01	2.55	351.86
Vinyl Chloride	-28	400	-13.8	760	245.1	259.3	3.45E+00	3.45	2819.28
1,1 Dichloroethane	14.8	400	31.7	760	287.9	304.8	3.67E-01	2.71	510.56
Carbon Disulfide	-5.1	100	28	400	268	301.1	7.89E-01	2.49	306.22
Water	11.2	10	22.1	20	284.3	295.2	8.99E-01	1.27	18.69

Log P = [log(P2/P1] * (T2/294.1) * [(20-T1)/(T2-T1)]+log P1
Vapor pressure (P) = 10^(log P)
P1 is the vapor pressure at temperature T1, etc.

Risk Calculation Worksheet

903 Pad Surface Water Treatment
Influent Tank Rupture (10,000 gal)
Exposure of the Public

Written: 30-Aug-90
Author: DCPalmer
Printed: 30-Aug-90

Constants:

Liter Per Gal	3.7853	
Sec Per Min	60	
R	62.37	mmHg l/gmole K
N/V	3.28E+01	
kg/mg	1.00E-06	
gm/kg	1.00E+03	
gm/mg	1.00E-03	
m3/ml	1.00E-06	

Adult Body Weight	BWa	70	kg
Child Body Weight	BWc	15	kg
Adult Inhalation Rate	IRa	0.83	Cubic meters/hour
Worker Inhalation Rate	IRw	1.4	Cubic meters/hour
Child Inhalation Rate	IRc	0.625	Cubic meters/hour

Operationing Release Parameters

Exposure Time	ET	24	Hours/day
Exposure Frequency	EF	1	Days/year
Adult Exposure Duration	EDa	1	Years
Youth Exposure Duration	EDy	0	Years
Child Exposure Duration	EDc	1	Years
Averaging Time (carc.)	ATc	25550	Days
Adult Avg Time (non-carc.)	ATna	365	Days
Child Avg Time (non-carc.)	ATnc	365	Days

Public Dispersion Factor	Chi over Q	4.01E-05	sec/cubic meter
	Job Duration	NA	Years
	Flow Rate	6.9	gpm

Carcinogenic:

	Liquid Conc (mg/l)	Slope Factor SF		Source (mg/sec)	Air Conc (mg/m3)	Adult Intake (mg/kg/day)	Adult Risk	Child Lifetime Risk
Carbon Tetrachloride	2.49E-01	1.30E-01	(b)	1.09E-01	4.37E-06	4.89E-11	6.36E-12	2.23E-11
Acetone	9.90E-02	0.00E+00		4.34E-02	1.74E-06	1.94E-11	0.00E+00	0.00E+00
1,1-Dichlorethene	1.27E-01	1.20E+00	(b)	5.56E-02	2.23E-06	2.50E-11	2.99E-11	1.05E-10
1,2-Dichloroethene	1.00E-02	0.00E+00		4.38E-03	1.76E-07	1.96E-12	0.00E+00	0.00E+00
Tetrachloroethene	2.35E-01	3.30E-03	(c)	1.03E-01	4.13E-06	4.62E-11	1.52E-13	5.33E-13
Trichloroethene	2.98E-01	1.70E-02	(c)	1.31E-01	5.24E-06	5.85E-11	9.95E-13	3.48E-12
Methylene Chloride	3.40E-02	1.40E-02	(b)	1.49E-02	5.97E-07	6.68E-12	9.35E-14	3.27E-13
Vinyl Chloride	1.10E-02	2.95E-01	(c)	4.82E-03	1.93E-07	2.16E-12	6.38E-13	2.23E-12
1,1 Dichloroethane	6.00E-03	9.10E-02	(e)	2.63E-03	1.05E-07	1.18E-12	1.07E-13	3.75E-13
Carbon Disulfide	5.00E-03	0.00E+00		2.19E-03	8.78E-08	9.82E-13	0.00E+00	0.00E+00
Totals	1.07E+00						3.83E-11	1.34E-10

Non-carcinogenic:

	Liquid Conc (mg/l)	RfD(a)		Source (mg/sec)	Air Conc (mg/m3)	Adult Intake (mg/kg/day)	Adult Risk	Child Intake (mg/kg/day)	Child Risk
Carbon Tetrachloride	2.49E-01	7.00E-03	(e)	1.09E-01	4.37E-06	3.42E-09	4.89E-07	1.20E-08	1.71E-06
Acetone	9.90E-02	1.00E-01	(e)	4.34E-02	1.74E-06	1.36E-09	1.36E-08	4.77E-09	4.77E-08
1,1-Dichlorethene	1.27E-01	9.00E-03	(d)	5.56E-02	2.23E-06	1.75E-09	1.94E-07	6.11E-09	6.79E-07
1,2-Dichloroethene	1.00E-02	2.00E-01	(e)	4.38E-03	1.76E-07	1.38E-10	6.88E-10	4.81E-10	2.41E-09
Tetrachloroethene	2.35E-01	1.00E-01	(e)	1.03E-01	4.13E-06	3.23E-09	3.23E-08	1.13E-08	1.13E-07
Trichloroethene	2.98E-01	NA		1.31E-01	5.24E-06	4.10E-09	NA	1.43E-08	NA
Methylene Chloride	3.40E-02	6.00E-02	(d)	1.49E-02	5.97E-07	4.68E-10	7.79E-09	1.64E-09	2.73E-08
Vinyl Chloride	1.10E-02	NA		4.82E-03	1.93E-07	1.51E-10	NA	5.29E-10	NA
1,1 Dichloroethane	6.00E-03	1.00E+00	(c)	2.63E-03	1.05E-07	8.25E-11	8.25E-11	2.89E-10	2.89E-10
Carbon Disulfide	5.00E-03	NA		2.19E-03	8.78E-08	6.88E-11	NA	2.41E-10	NA
Totals	1.07E+00						7.38E-07		2.58E-06

(a)RfDs based, where available, on Subchronic RfDs.
(b)Inhalation value, from IRIS
(c)Inhalation value, from HEAS, 4th Quarter, FY 1989
(d)Oral value, from IRIS
(e)Oral value, from HEAS, 4th Quarter, FY 1989

Source = Liquid Concentration * Flow Rate * Liters per gallon / seconds per minute
Air concentration = source * (X/Q)
Intake = (Air concentration * IR * ET * EF * ED) / (BW * AT)
Risk (for cancer) = Intake * Slope Factor
Risk (non-cancer) = Intake / RfD

Risk Calculation Worksheet

903 Pad Surface Water Treatment
Influent Tank Rupture (10,000 gal)
Exposure of RFP Workers

Written: 30-Aug-90
Author: DCPalmer
Printed: 30-Aug-90

Constants:

Liter Per Gal	3.7853	
Sec Per Min	60	
R	62.37	mmHg l/gmole K
N/V	3.28E+01	
kg/mg	1.00E-06	
gm/kg	1.00E+03	
gm/mg	1.00E-03	
m3/ml	1.00E-06	

Adult Body Weight	BWa	70	kg
Child Body Weight	BWc	15	kg
Adult Inhalation Rate	IRa	0.83	Cubic meters/hour
Worker Inhalation Rate	IRw	1.4	Cubic meters/hr
Child Inhalation Rate	IRc	0.625	Cubic meters/hour

Operationing Release Parameters

Exposure Time	ET	24	Hours/day
Exposure Frequency	EF	1	Days/year
Adult Exposure Duration	EDa	1	Years
Youth Exposure Duration	EDy	0	Years
Child Exposure Duration	EDc	1	Years
Averaging Time (carc.)	ATc	25550	Days
Adult Avg Time (non-carc.)	ATna	365	Days
Child Avg Time (non-carc.)	ATnc	365	Days

Worker Dispersion Factor	Chi over Q	3.46E-03	sec/cubic meter
	Job Duration	NA	Years
	Flow Rate	6.9	gpm

Carcinogenic:

	Liquid Conc (mg/l)	Slope Factor SF		Source (mg/sec)	Air Conc (mg/m3)	Intake (mg/kg/day)	Risk
Carbon Tetrachloride	2.49E-01	1.30E-01	(b)	1.09E-01	3.77E-04	4.22E-09	5.49E-10
Acetone	9.90E-02	0.00E+00		4.34E-02	1.50E-04	1.68E-09	0.00E+00
1,1-Dichlorethene	1.27E-01	1.20E+00	(b)	5.56E-02	1.93E-04	2.15E-09	2.58E-09
1,2-Dichloroethene	1.00E-02	0.00E+00		4.38E-03	1.52E-05	1.70E-10	0.00E+00
Tetrachloroethene	2.35E-01	3.30E-03	(c)	1.03E-01	3.56E-04	3.98E-09	1.31E-11
Trichloroethene	2.98E-01	1.70E-02	(c)	1.31E-01	4.52E-04	5.05E-09	8.59E-11
Methylene Chloride	3.40E-02	1.40E-02	(b)	1.49E-02	5.15E-05	5.76E-10	8.07E-12
Vinyl Chloride	1.10E-02	2.95E-01	(c)	4.82E-03	1.67E-05	1.86E-10	5.50E-11
1,1 Dichloroethane	6.00E-03	9.10E-02	(e)	2.63E-03	9.10E-06	1.02E-10	9.26E-12
Carbon Disulfide	5.00E-03	0.00E+00		2.19E-03	7.58E-06	8.48E-11	0.00E+00
Totals	1.07E+00						3.30E-09

Non-carcinogenic:

	Liquid Conc (mg/l)	RfD		Source (mg/sec)	Air Conc (mg/m3)	Intake (mg/kg/day)	Risk
Carbon Tetrachloride	2.49E-01	7.00E-03	(e)	1.09E-01	3.77E-04	2.95E-07	4.22E-05
Acetone	9.90E-02	1.00E-01	(e)	4.34E-02	1.50E-04	1.17E-07	1.17E-06
1,1-Dichlorethene	1.27E-01	9.00E-03	(d)	5.56E-02	1.93E-04	1.51E-07	1.67E-05
1,2-Dichloroethene	1.00E-02	2.00E-01	(e)	4.38E-03	1.52E-05	1.19E-08	5.93E-08
Tetrachloroethene	2.35E-01	1.00E-01	(e)	1.03E-01	3.56E-04	2.79E-07	2.79E-06
Trichloroethene	2.98E-01	NA		1.31E-01	4.52E-04	3.54E-07	NA
Methylene Chloride	3.40E-02	6.00E-02	(d)	1.49E-02	5.15E-05	4.03E-08	6.72E-07
Vinyl Chloride	1.10E-02	NA		4.82E-03	1.67E-05	1.31E-08	NA
1,1 Dichloroethane	6.00E-03	1.00E+00	(c)	2.63E-03	9.10E-06	7.12E-09	7.12E-09
Carbon Disulfide	5.00E-03	NA		2.19E-03	7.58E-06	5.93E-09	NA
Totals	1.07E+00						6.37E-05

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(e)Oral value, from HEAS, 4th Quarter, FY 1989

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Risk (for cancer) = Intake • Slope Factor
Risk (non-cancer) = Intake / RfD